Mamiya

REPAIR MANUAL

645 PRO
CAMERA BODY

MAMIYA AMERICA CORPORATION
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Catalog No. 20091140

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1. CMERA BODY

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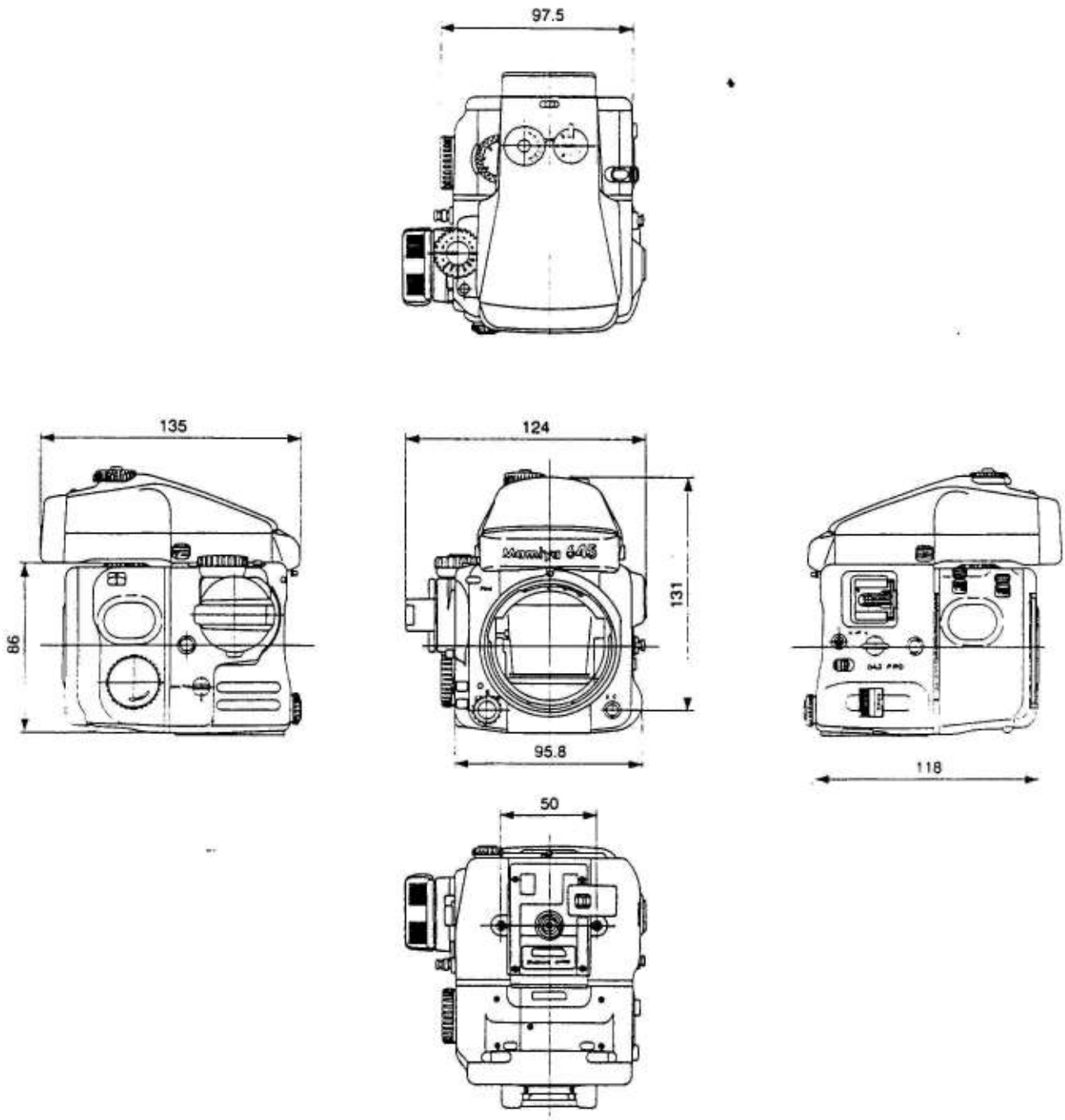

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MAMIYA-645 PRO SPECIFICATIONS

Type	6 × 4.5 cm sized single-lens reflex camera with an electronically controlled forcal-plane shutter
Size of image plane	Semi-brownie size : Actual image plane size 56 mm × 41.5 mm
Film for use	120 film (120 roll film holder) 15 expansure 220 film (220 roll film holder) 30 exposures Instant film (Polaroid Land pack film holder) Polaroid 100, 600 series, Fuji FP series 135 film (135 film holder) 35 mm film, Panoramic film
Film loading	Middle frame type (120 and 220 roll film holder) (135 film holder) Pack type (Polaroid Land pack film holder) All these films are supplied together with ISO sensitivity dial, and sliding cover type safety device.
Standard lens	Mamiya-Sekore C80mm f/2.8N
Lens mount	Mamiya M645 Bayonet Mount (All M645 lens can be mounted.)
Shutter	Electronically controlled focal-plane shutter (The seconc curtain is controlled by moving coil.)
Shutter speed	Manual : 4 sec. to 1/1000 sec., B.T. Auto : 8 sec. to 1/1000 sec. (When the AE prism finder is used.)
Shutter button	Electro-magnetic release Changeable to lock and self-timer modes by pressing the selector switch.
Mirror	Instant return reflective mirror with mirror lock-up device
Finder	Changeable (Waiste level finder, prism finder, AE prism finder) (Finder for M645 Super can be used.)
Finder screen	With standard micro/split (horizontal) fresnel lens, periphery of which is mat screen.
Visual field factor	Real image plane ratio Approx. 94%

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Film advancing	One revolution advancing by a handle with crank Crank starting position can be set at 6 places. Interchangeable with winder grip
Film counter	Automatic restoration, sequential counting Films 120, and 220 are automatically changed by the middle frame.
Multiple exposure	Practicable with multiple exposure selector lever
Depth of field	Lens with graduations for the depth of filed, practicable to check with A-M selector lever
Self-timer	Electronic self-timer, working time : 10 seconds, suspension on the halfway is feasible, Working is indicated by the LED
Auxiliary release contact point	Releasing is feasible by inserting electro-magnetic cable release into the contact point of the body. The cable release can also be used by inserting the cable release adapter or the terminal adapter into the said contact point.
Battery checker	The LED displays the remaining amount of electricity in 3 steps when the battery check button is pressed.
Synchronized flashing	X contact (Hot shoe and terminal)
Back lid	With housing pocket for sliding lid With memo-pocket (excluding Polaroid Land Pack Film Holder)
Operating temperature	−10 to +40° C (relative humidity; 85%)
Feasilble number of photographings (Battery life)	10,400 times (4LR44) ┌ With AE prism finder ├ Shutter speed: 1/60 sec. ├ Continuous photographing └ at normal temperature
Power source	One 6V electric cell (4SR44 Mercury cell, 4LR44 Alkali-manganese cell and Lithium cell) Interchangeable (common with the screen of M645 Super)
Others	With a neck strap
Dimensions	(W) × (H) × (D) 92 × 102.5 × 69
Weight	550g (excluding battery)

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1 LEFT, RIGHT AND BOTTOM COVERS

Fig.3

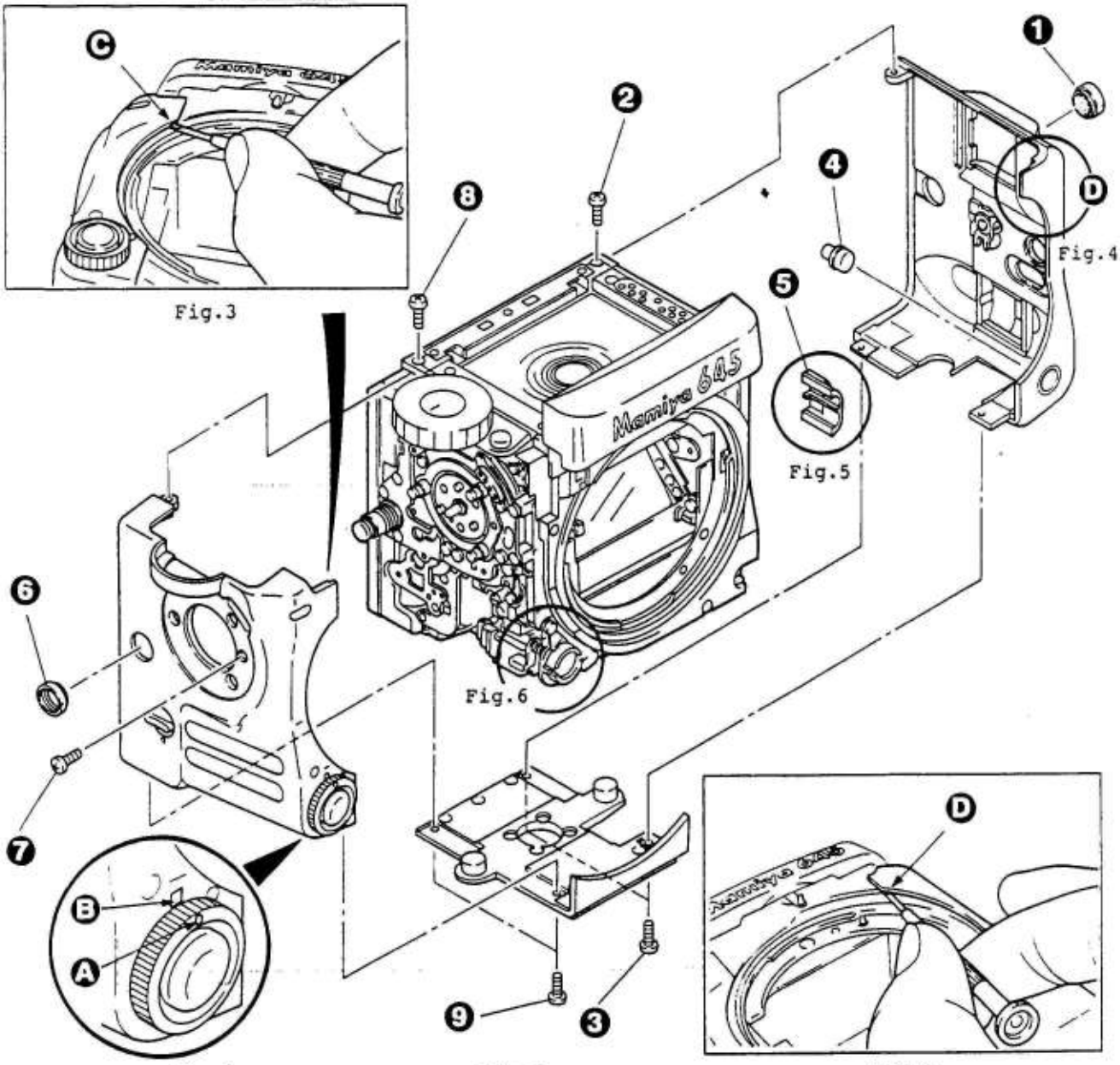

Fig.4

Fig.5

Fig.6

Fig.2

Fig.1

Fig.4

As for the disassembly and reassembly not described herein, please refer to the exploded views in the Parts Catalogue. Here, we mention only key points of disassembly, reassembly and adjustment.

[A. DISASSEMBLY]

1. Disassemble in the order of numerical figures shown in small circles. (See Fig. 1.)
2. Set the release selector at the release position (set the index mark Ⓐ to the □ mark Ⓑ.), and remove the left cover. (See Fig. 2.)
3. For removing the hooks Ⓒ and Ⓓ of left and right covers, insert a thin plate (No.2 (–) screw driver) and push up them. They may easily be taken out. Meantime, when inserting a screw driver, exercise good care not to mar the cover. (See Fig. 3, Fig. 4)

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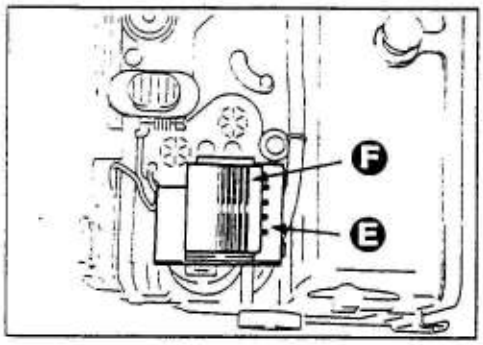

Fig.5

[B. REASSEMBLY]

Reassemble in the reverse order of disassembly.

1. Before reassembling right cover, insert the RC cover Ⓕ to the RC pin base Ⓔ from the direction RC and then assemble right cover. (See Fig. 5.)

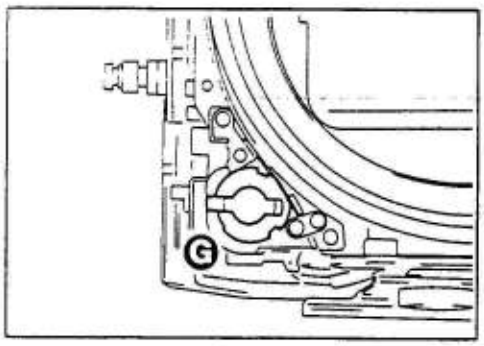

Fig.6

2. Set the release selector to the release position Ⓖ and then install. (See Fig. 6.)

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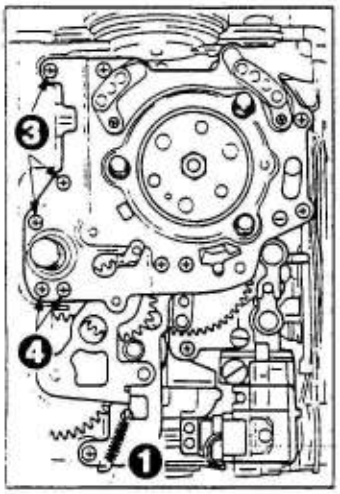


Fig.1

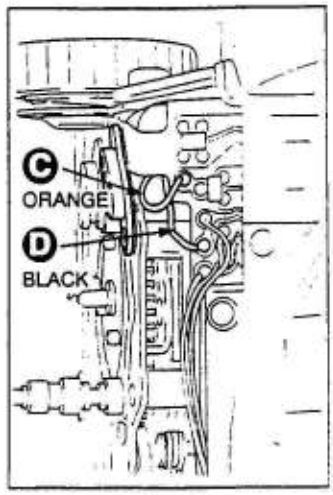
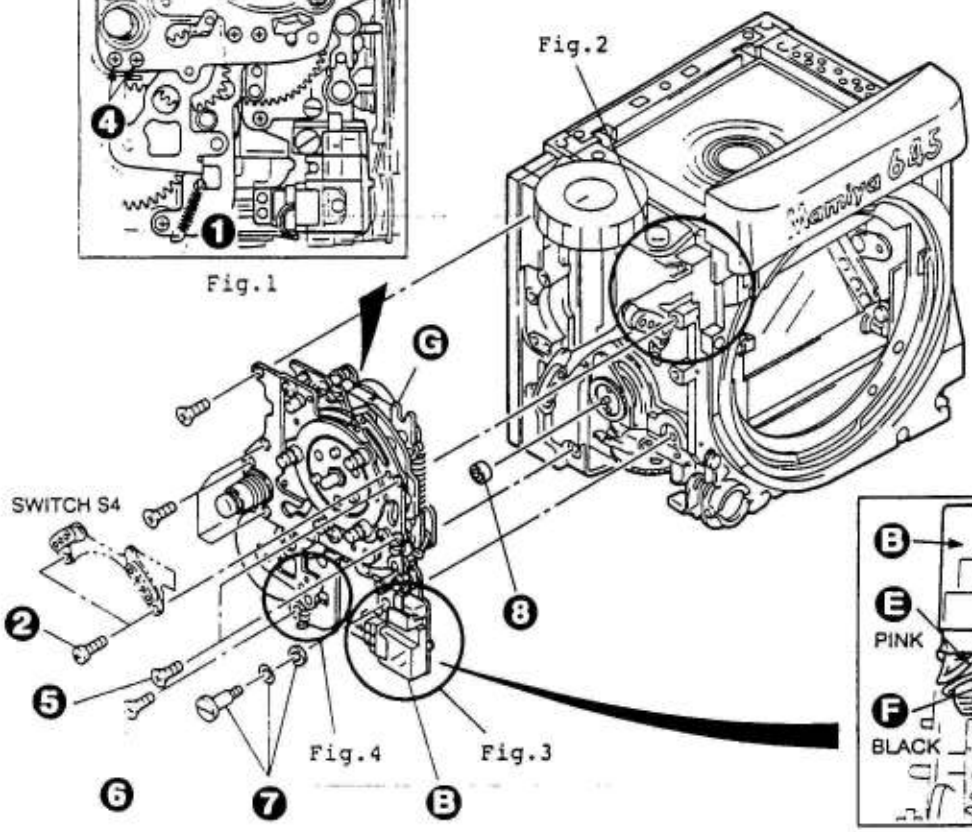


Fig.2



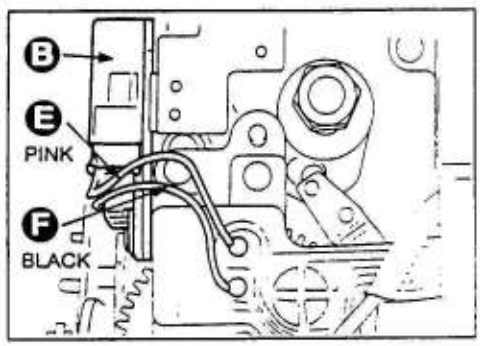


Fig.3

[A. DISASSEMBLY]

1. Disassemble in the order of numerical figures shown in small circles. (See Fig. 1.)
2. Unsolder orange Ⓒ and black Ⓓ lead wires from the switch S4. (See Fig. 2.)
3. Unsolder pink Ⓔ and black Ⓕ lead wires from the MR unit Ⓑ (magnet). (See Fig. 3.)

Note: Let the F3 gear substrate Ⓐ escape in the arrow direction, and remove the wind-up substrate unit Ⓖ. (See Fig. 1.)

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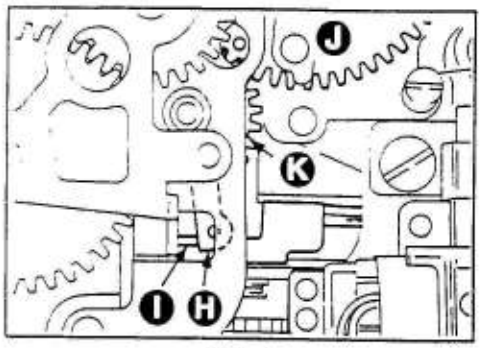

Fig.4

[B. REASSEMBLY]

1. Reassemble in the reverse order of disassembly.
2. Set the mirror release lever Ⓗ on the right side of the release lever Ⓘ, and right the S2 gear Ⓙ engage wit the S3 gear Ⓚ.

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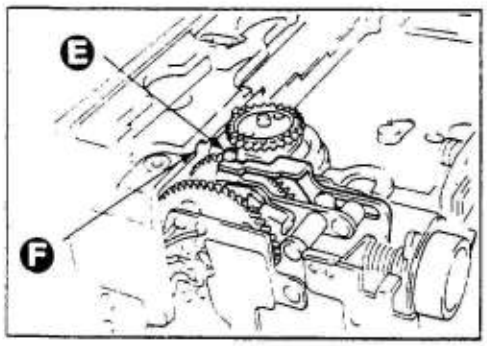

Fig.4

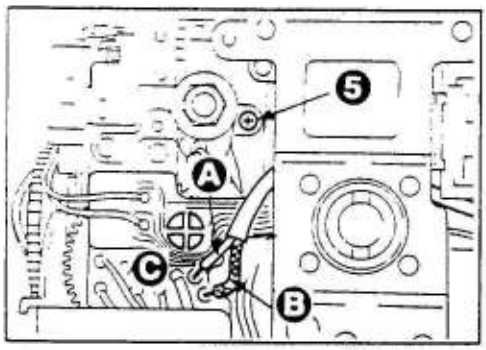

Fig.2 BOTTOM VIEW

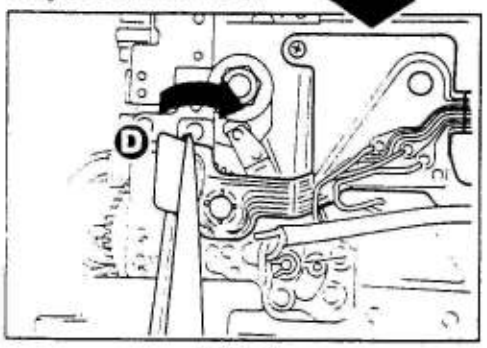

Fig.3

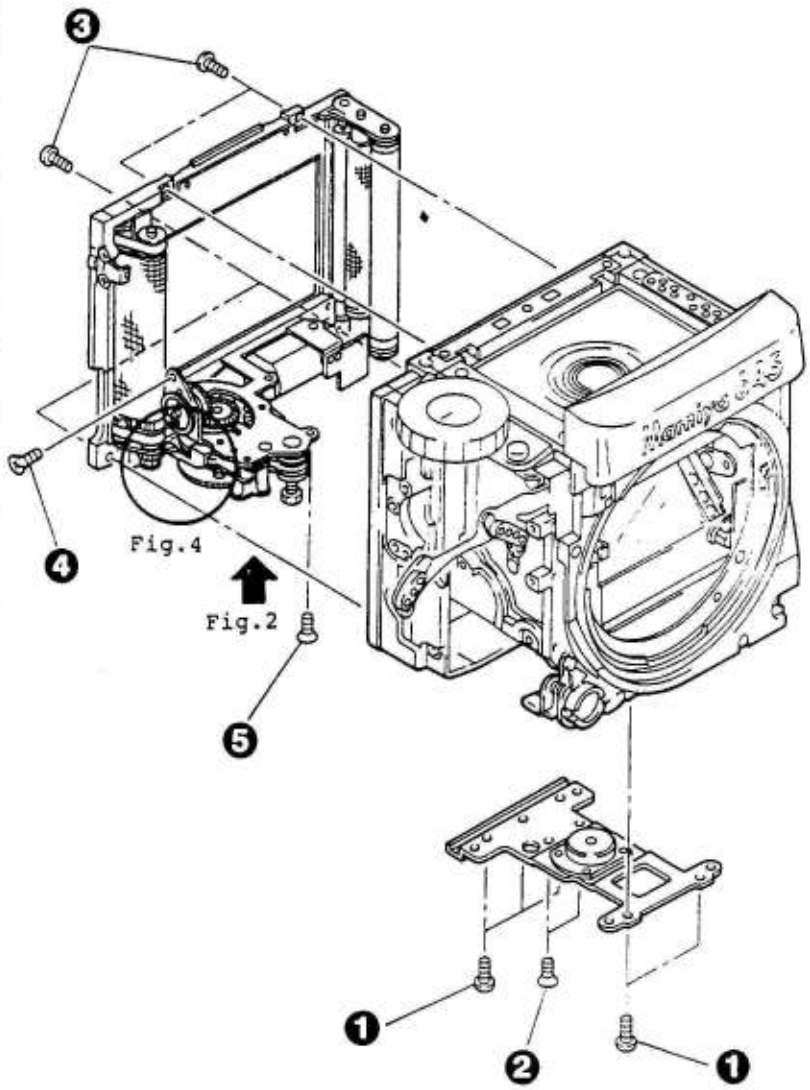

Fig.1

[A. DISASSEMBLY]

1. Remove the wind-up substrate. (Refer to on page 6.)
2. Disassemble in the order of numerical figures shown in small circles. (See Fig. 1.)
3. Remove the synchro-cords Ⓐ and Ⓑ from the relay substrate. (See Fig. 2.)
4. Unsolder four connected points of the main flexible substrate Ⓒ, using the desoldering wire (solder-wick).
5. Peel off the main flexible substrate in the arrow direction.(As this is adhered with pressure sensitive double coated tape, be careful not to break the flexible substrate. (See Fig. 3.)

Note : When removing the shutter substrate, remove the tip of the release lever Ⓔ through the groove Ⓕ of the body. (See Fig. 4.)

[B. REASSEMBLY]

1. Reassemble in the reverse order of disassembly.

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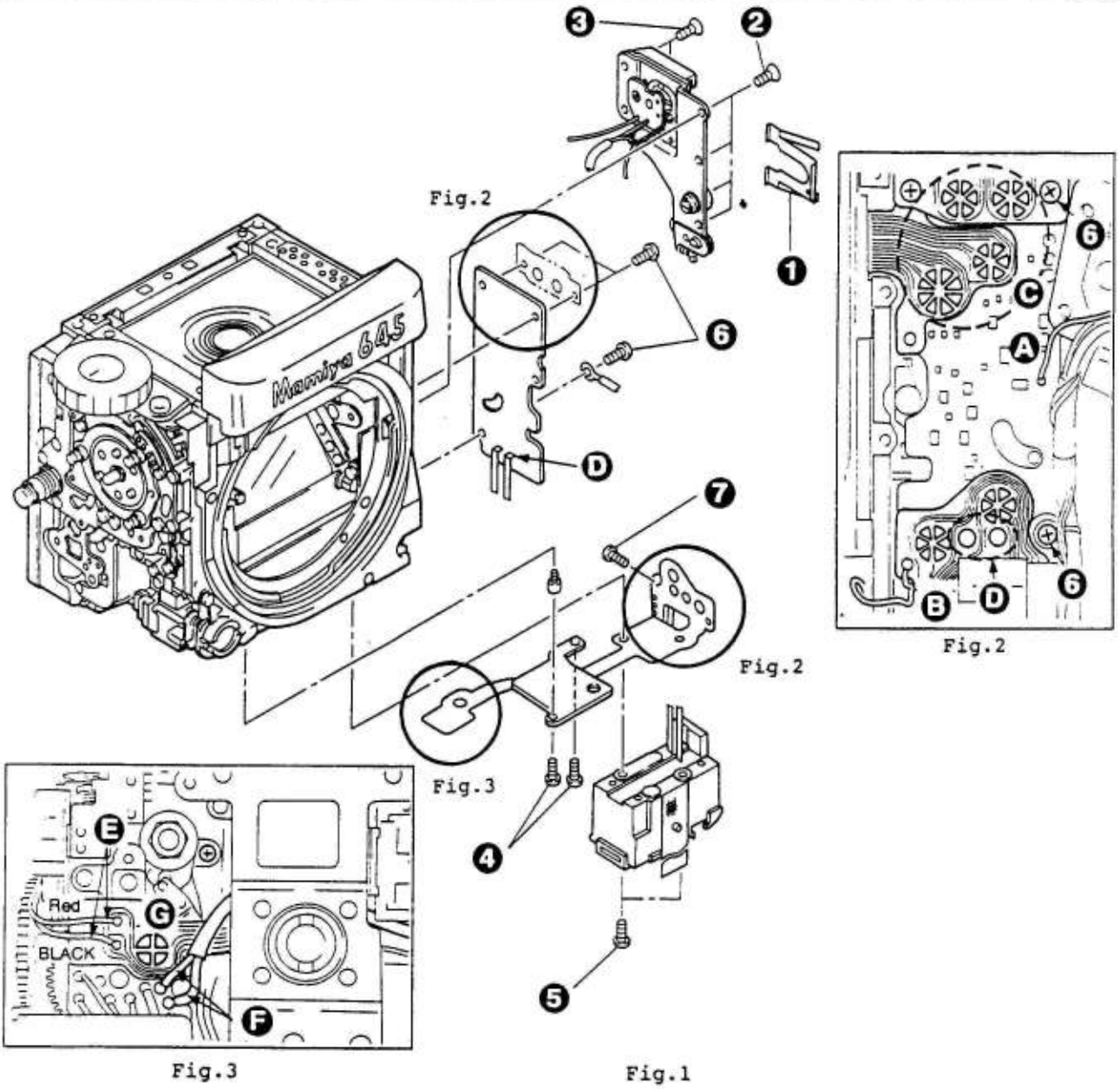

Fig.2

Fig.2

Fig.2

Fig.3

Fig.3

Fig.1

[A. DISASSEMBLY]

1. Disassemble in the order of numerical figures shown in small circles. (See Fig. 1.)
2. With desoldering wire (solder wick) remove the lead wires Ⓐ, Ⓑ, Ⓔ (each 2 wires), Ⓕ (2 places), and connected parts of flexible substrate Ⓒ, Ⓓ, Ⓖ. (See Figs. 2 and 3.)
   Part Ⓒ : 26 places Part Ⓓ : 2 places Part Ⓖ : 4 places

Note : As the flexible substrate is adhered with pressure sensitive double coated tape, be careful not to break it when peeling off the tape.

3. Remove two places of contact Ⓓ from the battery case. (See Fig. 1.)

[B. REASSEMBLY]

1. Reassemble in the reverse order of disassembly.

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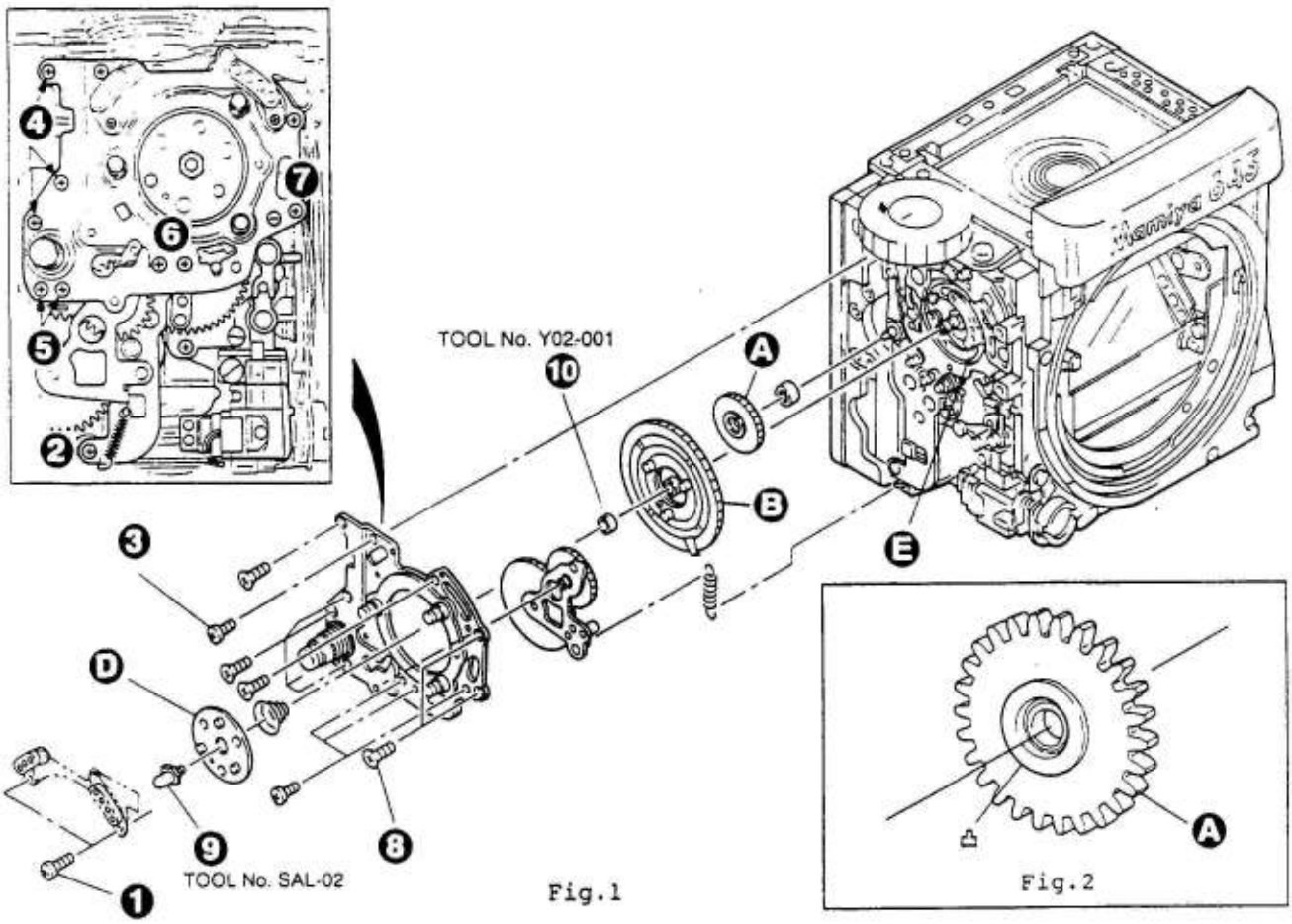

Fig.1

Fig.2

[A. DISASSEMBLY]

1. Disassemble in the order of numerical figures shown in the small circles.

Note : When disassembly with wind-up substrate from its front face, be sure not to disassemble other parts than the parts numbered ① to ⑩ in Fig. 1. (When disassembling the clutch substrate Ⓔ, pay attention to the position for reassembling.)

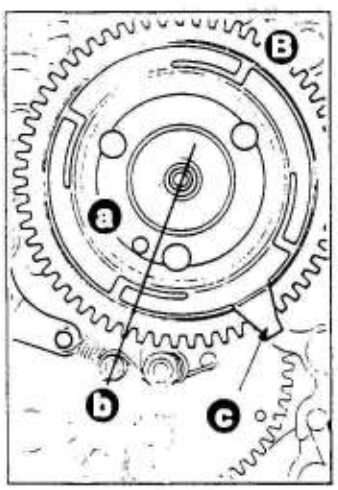

Fig.3

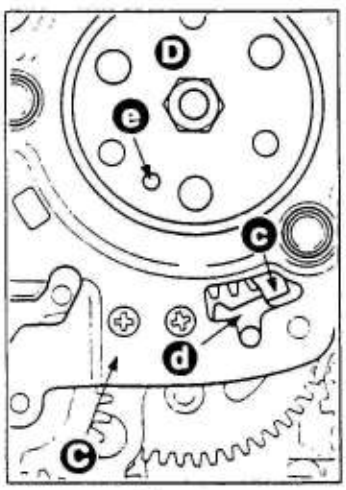

Fig.4

[B. REASSEMBLY]

1. Reassemble in the reverse order of disassembly.
2. Assemble the F. idle gear Ⓐ so that its convex face will be on the side of wind-up substrate Ⓒ. (See Fig. 2.)
3. The F1 gear Ⓑ shall be installed to the position on a straight line connecting the centers of the positioning holes both ⓐ and ⓑ. (See Fig. 3.)
4. Put the plate Ⓒ in the notch of claw ⓓ of the wind-up substrate ⓒ. (See Fig. 4.)
5. Insert the coupler plate Ⓓ so that its positioning hole ⓔ will fit to the hole ⓐ in the F1 gear. (See Fig. 3.)

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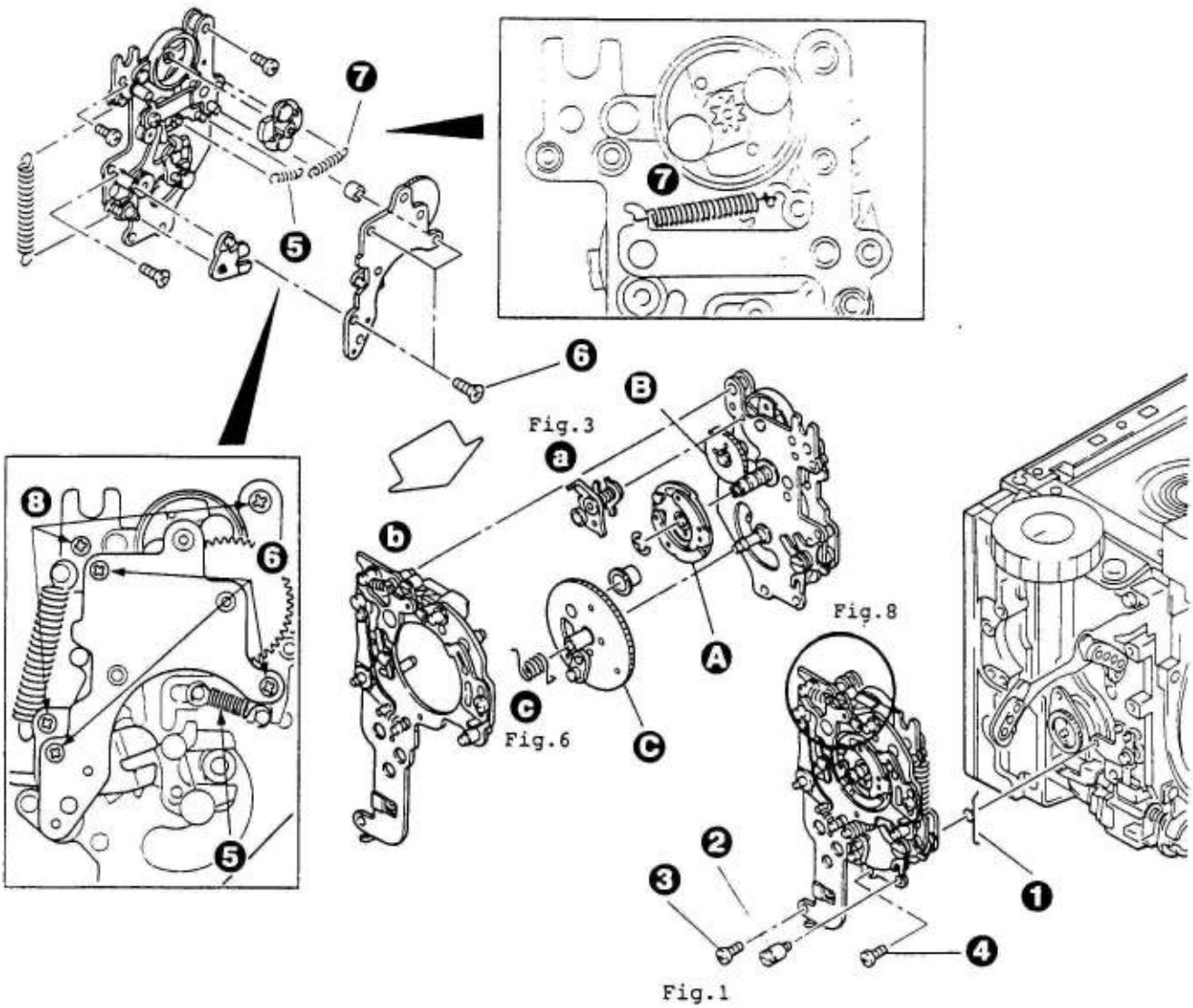

Fig.1

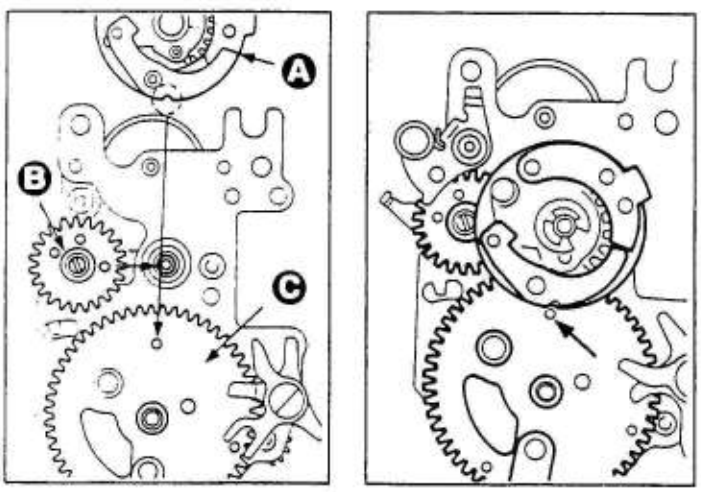

Fig.2

[A. DISASSEMBLY]

1. Disassemble in the order of numerical figures shown in small circles.

Note : ***First remove the springs ⑤ and ⑦, then remove three screws ⑧. (See Fig. 1.)***

[B. REASSEMBLY]

1. Reassemble in the reverse order of disassembly.
2. Positional relationship of each gear, viz. Ⓐ, Ⓑ and Ⓒ is shown in Fig. 2.(Gear Ⓑ is in the shape of a cam (reverse side), and its starting position is fitted.)

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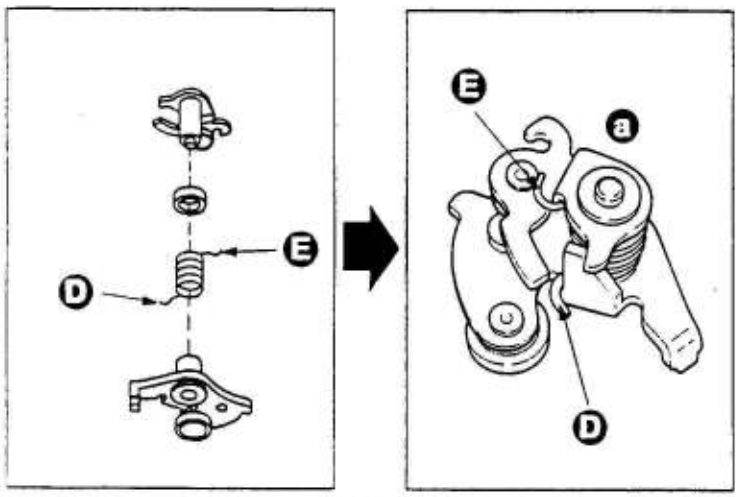

Fig.3

3. Subassemble the S. lever ass'y ⓐ by hitching the hooks Ⓓ and Ⓔ of the spring as shown in Fig. 3, and then install to the substrate M.

4. Take off once the spring of reversal lever claw Ⓕ, and move the reversal lever claw to make a gap, in which insert the S. lever ass'y ⓐ as shown in Fig. 4. (See Fig. 4.)
Next, place the substrate F ⓑ, when pay attention to the fitting position of the lever Ⓖ. (See Fig. 5.)
Hook the spring of reversal lever claw Ⓕ.

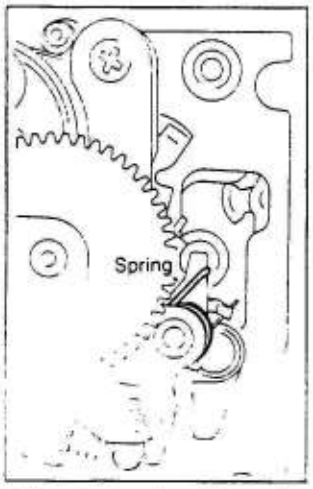

Fig.4 Back side view

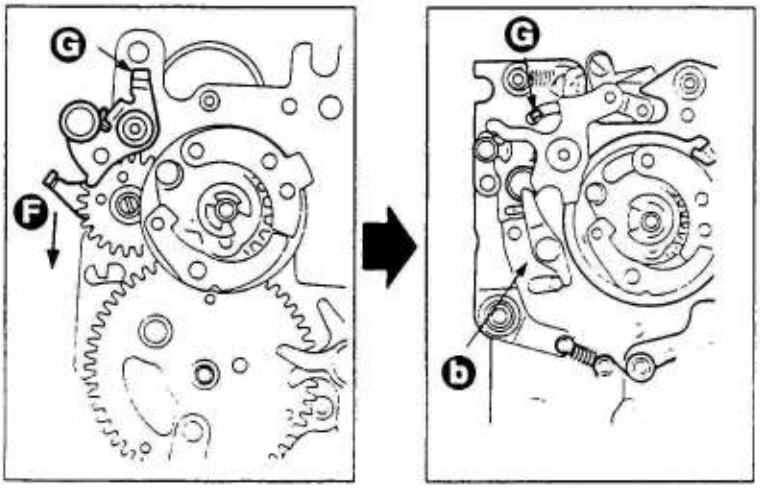

Fig.5

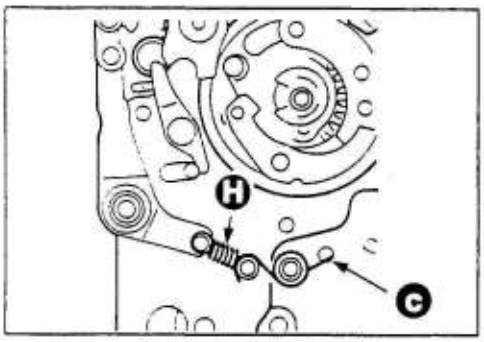

Fig.6

5. After hooking the spring Ⓗ, hook the spring Ⓒ while pushing it down from above. (See Fig. 6.)

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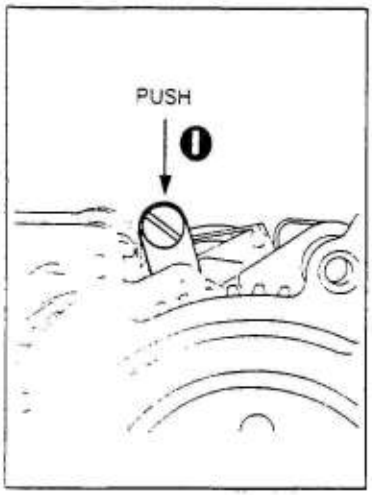

Fig.8

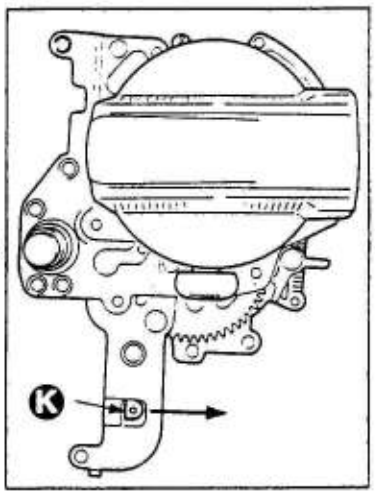

Fig.7

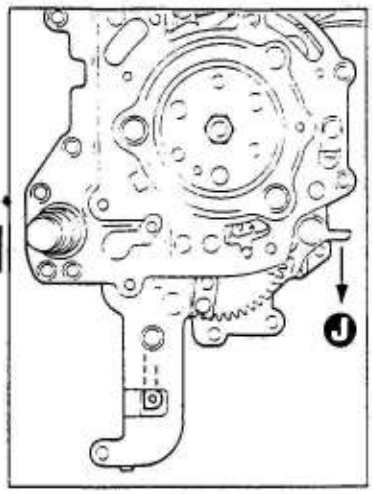

Fig.9

[C. CHECK]

1. nstall the crank knob, and check wind-up operation. (See Fig. 7)
2. Push the wind-up stopper lever Ⓘ to release the stopper, and wind the crank knob up. (See Fig. 8.)

   Check that the stopper lever Ⓘ is at the position in the middle of wind up motion, i.e. down position at this time, and when wind-up operation is completed and set, this lever returns simultaneously to its original position.

3. Push the lever Ⓙ, and release wind-up. (See Fig. 9.)
4. Next, push the lever Ⓚ in the arrow direction to release the mirror up lever and the friction gear. (See Fig. 10.)

   Check that the wind-up stopper lever I goes down when the lever Ⓚ is pushed in the arrow direction all the way, and when the lever Ⓚ is brought back, the wind-up stopper lever Ⓘ returns to its original position.

5. Repeat the above mentioned steps 1 to 4 for several times, and check to see if all the mechanisms function smoothly.

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2. ROLL FILM HOLDER

2-2 DISASSEMBLY AND REASSEMBLY

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2. WIND-UP SUBSTRATE UNIT 15

2-3 ADJUSTMENT

1. FILM STARTING POSITION ADJUSTMENT 16

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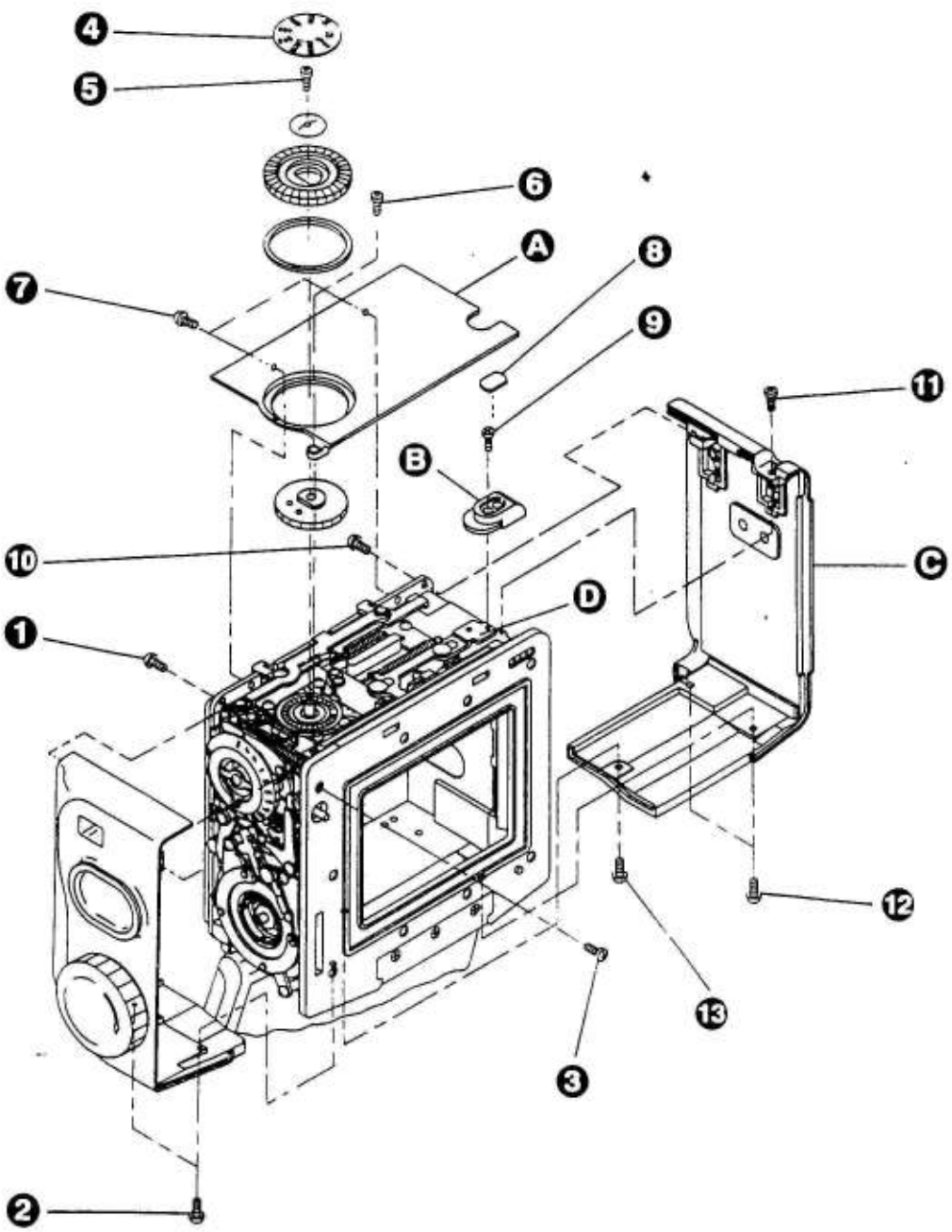

[A. DISASSEMBLY]

1. Disassemble in the order of numerical figures shown in small circles.
2. Remove the right cover Ⓒ after removing the upper cover Ⓐ and the knob Ⓑ.

Note : If you try to remove the right cover Ⓒ before removing the knob Ⓑ, there is a fear of bending the lever Ⓓ.

[B. REASSEMBLY]

1. Reassemble in the reverse order of disassembly.

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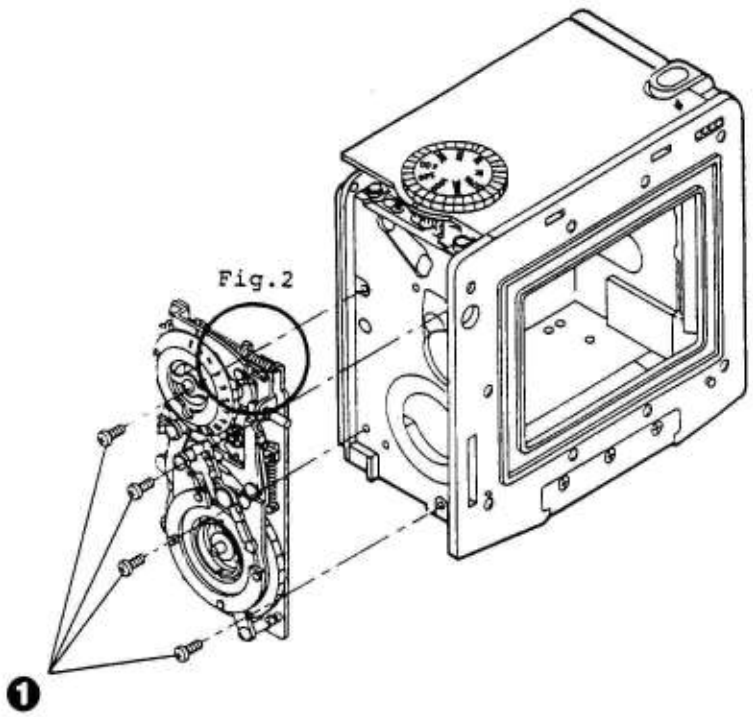

Fig.1

[A. DISASSEMBLY]

1. Remove four screws ①. (See Fig. 1.)

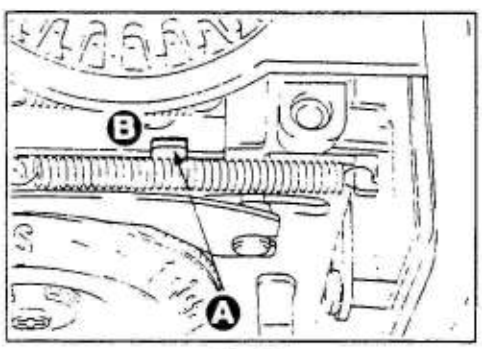

Fig.2

[B. REASSEMBLY]

1. Reassemble in the reverse order of disassembly.
2. Insert the lever Ⓐ of the winding substrate ass'y into the groove Ⓑ of transmission lever of the upper substrate ass'y. (See Fig. 2.)

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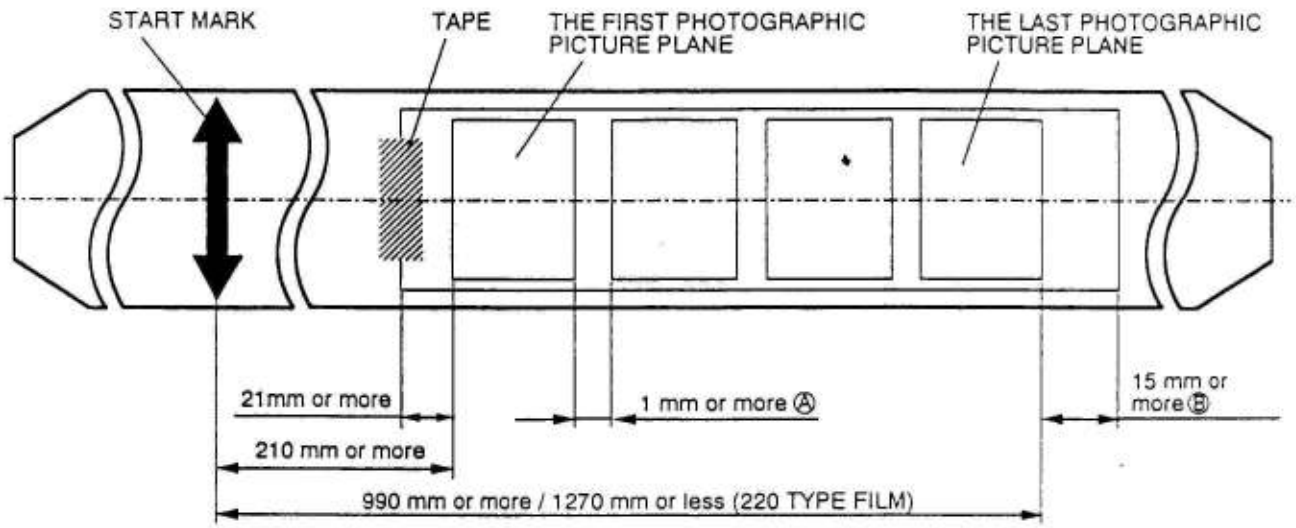
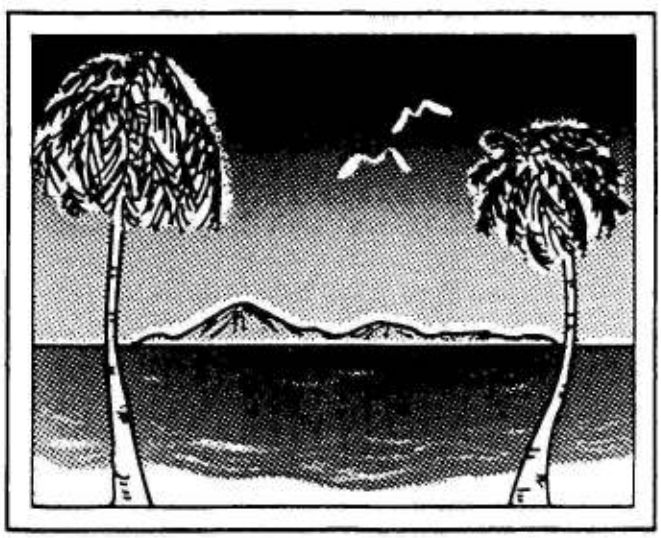

START MARK
TAPE
THE FIRST PHOTOGRAPHIC PICTURE PLANE
THE LAST PHOTOGRAPHIC PICTURE PLANE
21mm or more
1 mm or more Ⓐ
15 mm or more Ⓑ
210 mm or more
990 mm or more / 1270 mm or less (220 TYPE FILM)

Ⓐ・Ⓑ: ***A standard as to the space between picture planes is added. (This is applicable to M645 SUPER.) As for the Film Starting Position Adjustment Procedure, refer to Repair Manual of the M645 SUPER.***
Refer to page 86.



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1-3 ADJUSTMENT

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1 S4 SWITCH AND WIND-UP STOPPER LEVER

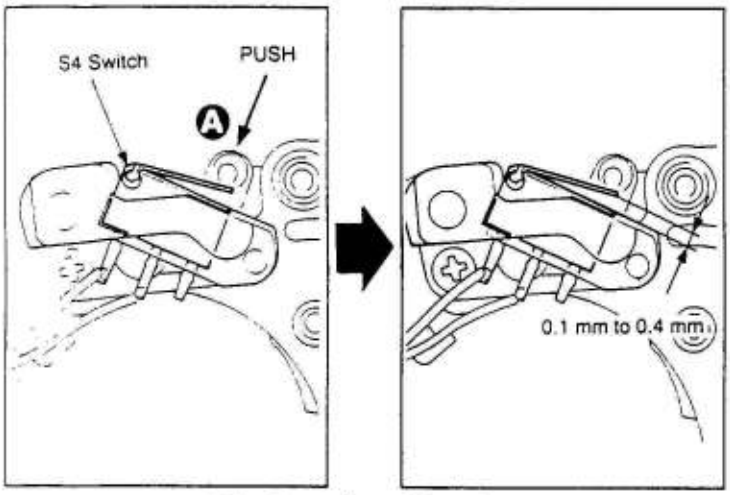

Fig.1 Back side view

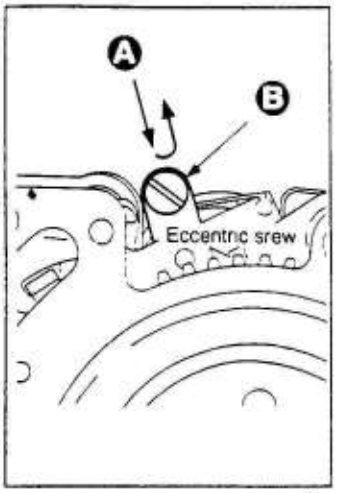

Fig.2

[A. ADJUSTMENT]

1. Adjust so that the clearance between the contact of the S4 switch and the upper tip of the switch will be 0.1 to 0.4 mm when the wind-up stopper lever Ⓐ is pressed fully. (See Fig. 1.)
2. Adjust be turning an eccentric screw Ⓑ. (See Fig, 2.)

Note : After adjustment, apply "Lock Tight" to the eccentric screw Ⓑ.

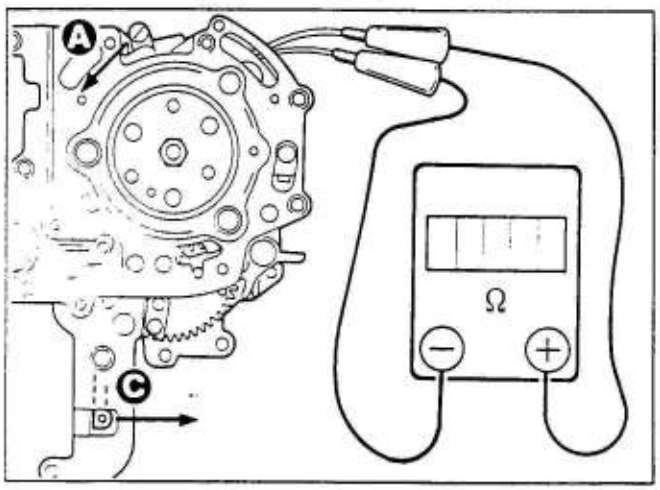

Fig.3

3. Connect the tester to the switch cord. (See Fig. 3.)
4. Push the lever Ⓒ fully in the arrow direction and keep it as it is, and press down slowly the wind-up stopper lever Ⓐ with a finger. (See Figs. 2 and 3.)
5. When the switch turns "ON", put the finger off. Then, the wind-up stopper lever Ⓐ returns surely to its original position and the switch must turn "OFF". (When checking, do not press the wind-up stopper lever Ⓐ beyond the position where the switch turns "ON".)

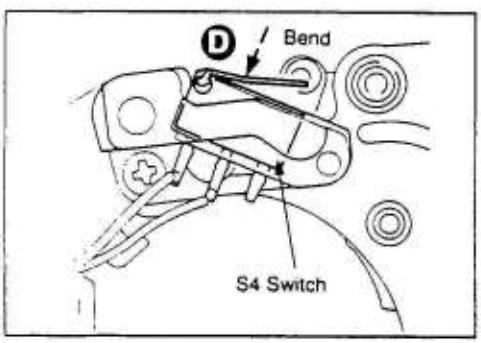

Fig.4

6. If the wind-up stopper lever Ⓐ does not return, bend the contact of the S4 switch to strengthen its bounce ability. (See Fig. 4.)

Note : Do not over bend the contact of the switch more than necessity.

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2 ADJUSTMENT OF WIND-UP OVER SET

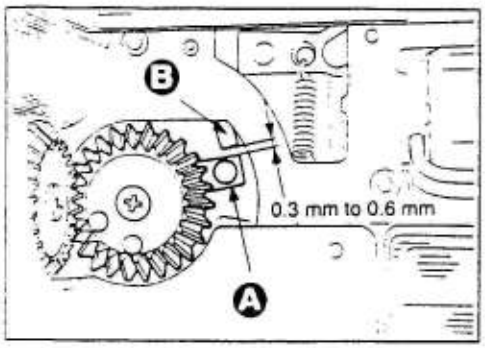

Fig.1

In the process of winding up the wind-up crank, the shutter charge gear (first and second curtains) will be set, and next, the clutch for wind-up crank will get out of gear, which means completion of wind-up motion. In this process, the over set of shutter charge and the timing of clutch getting out are the important problems.

Adjustment is made fundamentally in the state that the mirror box is removed. However, we also mention a simple method of adjustment.

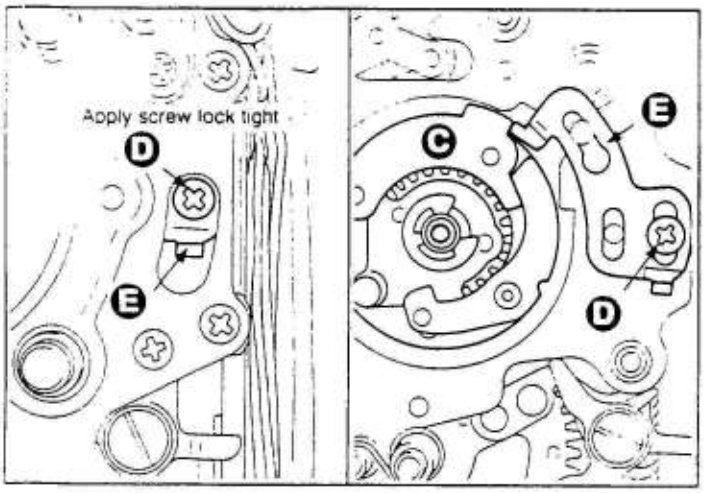

Fig.2

[A-1. ADJUSTMENT]

1. Wind up the wind-up crank until the space between the second curtain charge gear Ⓐ and the hook Ⓑ of the second curtain becomes 0.3 to 0.6 mm, at this time, the clutch Ⓒ of the wind-up substrate must get out of the gear.
   Loosen the screw Ⓓ and adjust the position of the stopper Ⓔ so that the clutch works at the timing as described above. (See Fig. 1.)

[B. CHECK]

1. If the clutch Ⓒ gets out of the gear before the second curtain charge gear Ⓐ hitches the second curtain hook Ⓑ, the first curtain would run as soon as the wind-up crank is wound.
   ① The MC works but the shutter cannot released.
   ② The shutter can be released but the curtain does open.

2. If the over set is too large, wind-up and setting cannot be made.
   Even if wind-up and setting could be made, release of crank becomes heavy.
3. Repeat shutter releasing for several times for checking smooth operation.

Note : After adjustment, be sure to apply screw lock tight to the screw Ⓓ.

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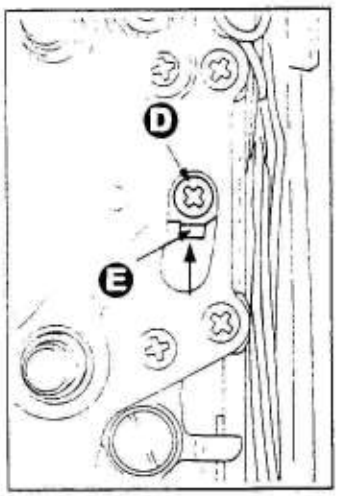

Fig.3

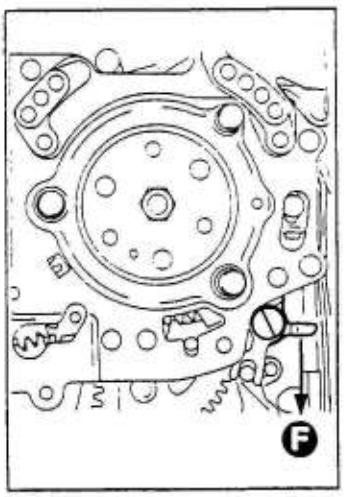

Fig.4

[A-2. ADJUSTMENT]

1. Loosen the screw Ⓓ and push the stopper Ⓔ in the arrow direction until it comes to the end. Then, tighten the screw temporarily. (See Fig. 3.)
2. Wind the wind-up crank and press the release button.

At this time, if you cannot release (the shutter does not run), release it forcibly, and make it possible to wind up.

① Push the lever Ⓕ in the arrow direction to let the first curtain run. (See Fig. 4.)

② Push the second curtain Ⓖ (white) and let it run. (See Fig. 5.)
(Through the hole in the lower substrate insert No.2 (–) screw driver and release the shutter. (See Fig. 5.)

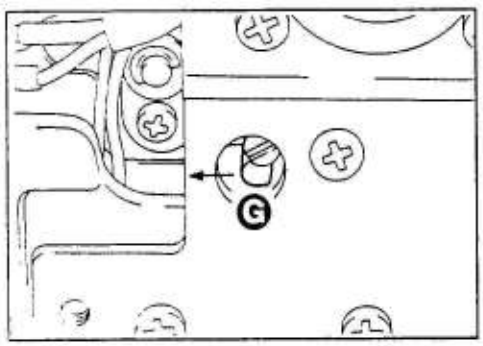

Fig.5

3. Next, loosen the screw Ⓓ and move the stopper Ⓔ a little in the arrow direction. Then, tighten the screw Ⓓ temporarily and repeat the step 2 again.

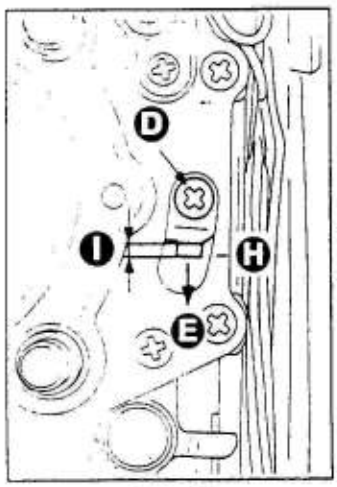

Fig.6

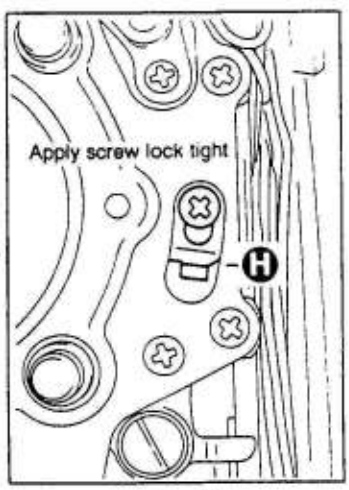

Fig.7

4. While repeating the steps 2 and 3, find out the position where you can release the shutter, and put the mark Ⓗ. (See Fig. 6.)
5. In the arrow direction move the stopper Ⓔ further from the position marked Ⓗ to the position Ⓘ, which distance is equal to the thickness of the stopper Ⓔ.
At this position, tighten the screw Ⓓ finally and firmly. (See Fig. 7.)
(This position corresponds with the position of overcharge 0.3mm)

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3 POSITIONING ADJUSTMENT OF THE FIRST AND SECOND SHUTTER CURTAINS AND SHUTTER CURTAIN SPEED ADJUSTMENT

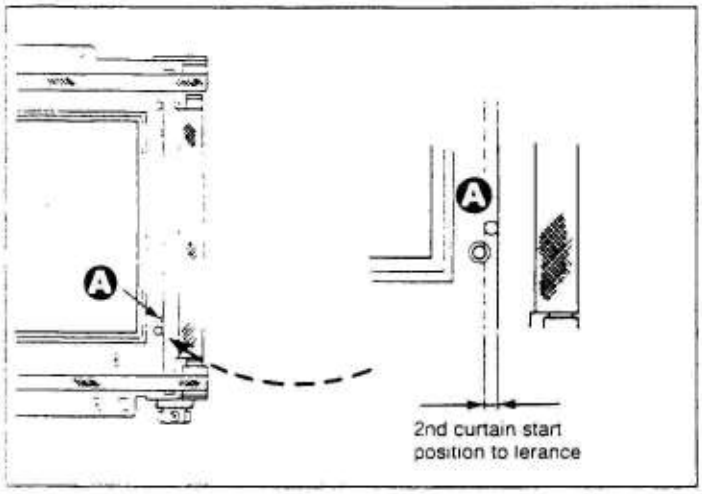

Fig.1

For the assembly and adjustment procedures of the shutter curtain start positioning, refer to repair manual of the M645 SUPER.
(See Fig. 1)
Note: Refer to pages 31 to 33.

We show assembly tolerance of the M645 SUPER. (See Fig. 2)
Note: Refer to pages 31 to 34.

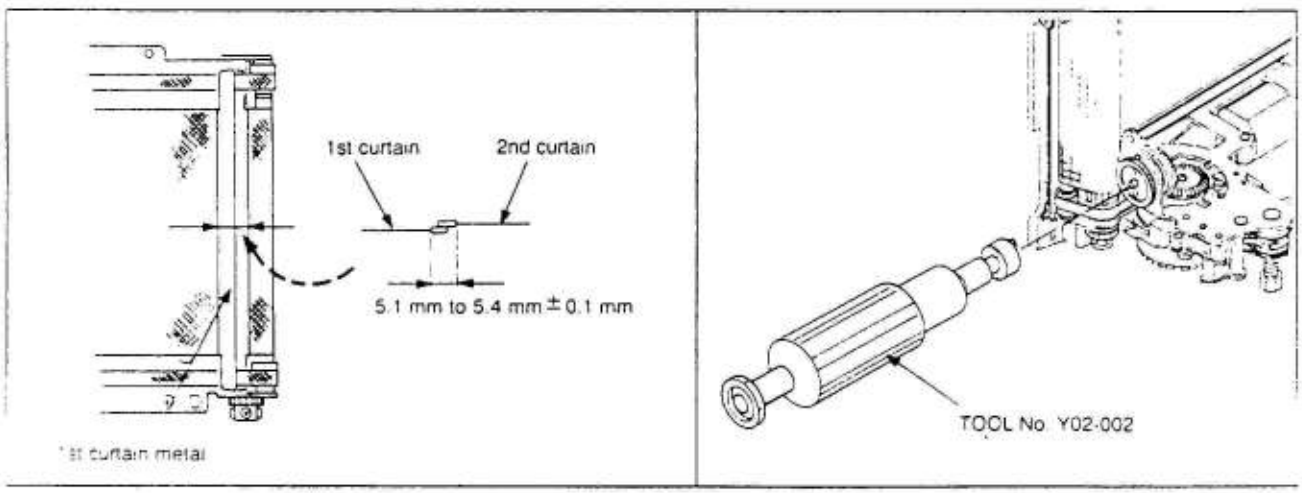

Fig.2

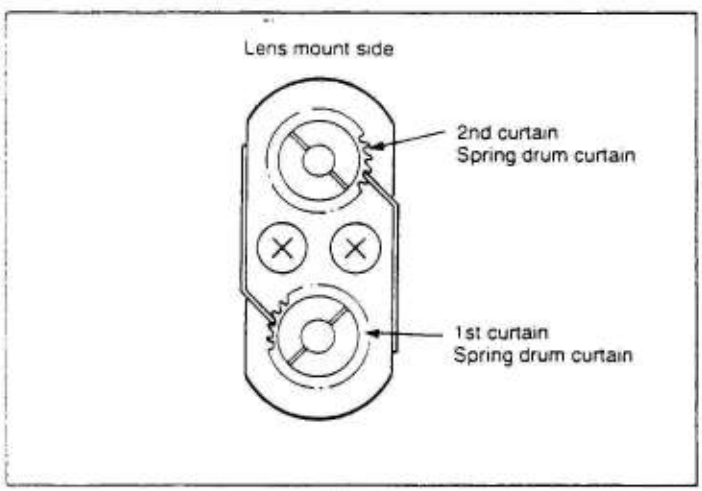

Fig.3

We show adjustable range of the M645 PRO shutter curtain speed as follows (See Fig. 3)
Note: Refer to pages 34.

① First curtain	1/1000	13.3 mS	± 0.2 mS
② Second curtain		13.3 mS	

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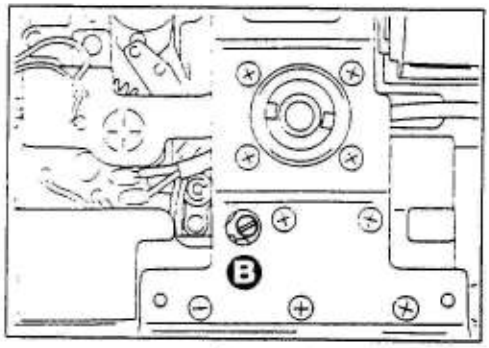

Fig.4 Bottom view

1. Shutter speed adjustment is made only for 1/1000 mS.
(As for 1/500 mS to 4S, correct value for each speed can be obtained necessarily but be sure to check each shutter speed.)

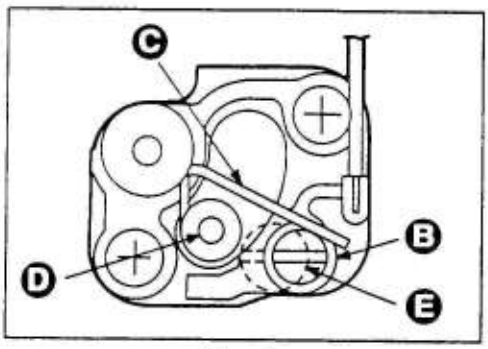

Fig.5

2. ADJUSTMENT
Turn an eccentric pin Ⓑ, and adjust the clearance between the trigger switch contact Ⓒ and working pin Ⓓ. (See Fig. 4.)

Notes :

① ***If the eccentric pin Ⓑ is drawn too much in the direction Ⓔ, it will touch the working pin Ⓓ, resulting in malfunction. So, be careful.***
(See Fig. 5.)

② ***Check the source voltage is 6V.***

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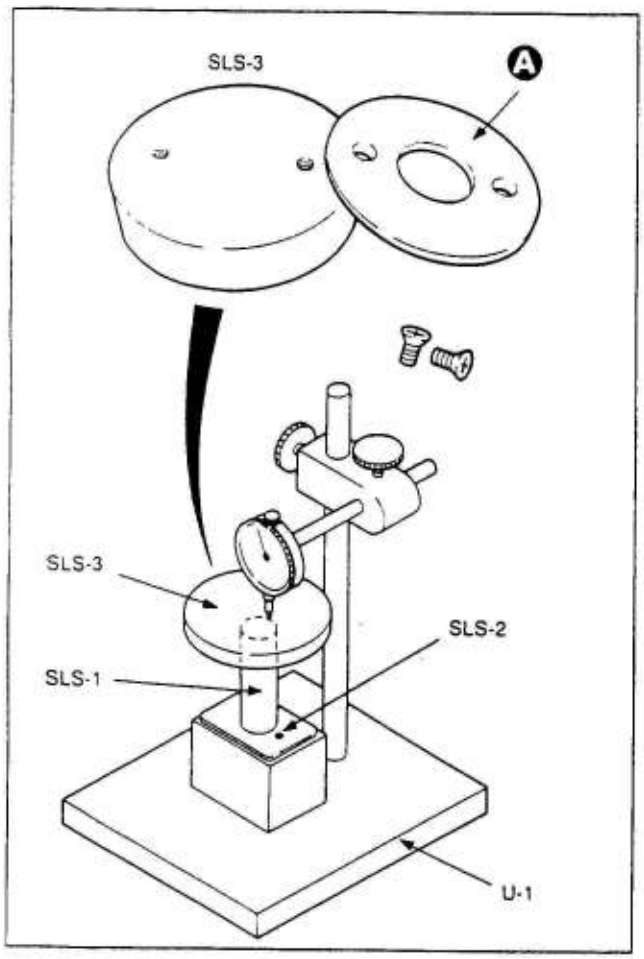
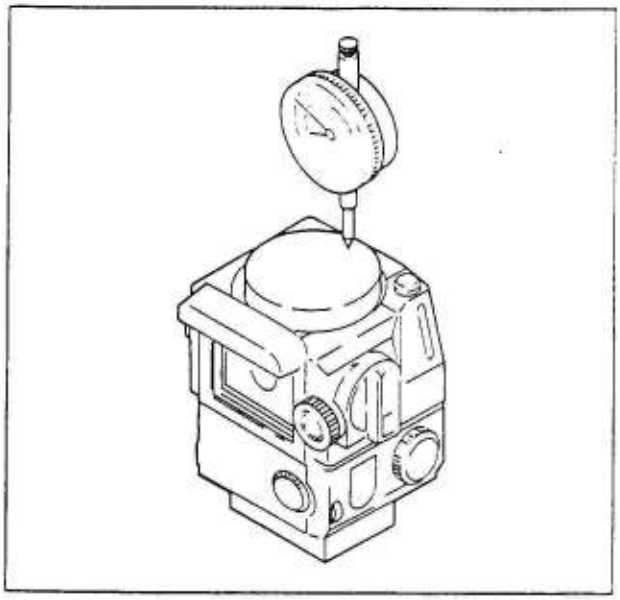
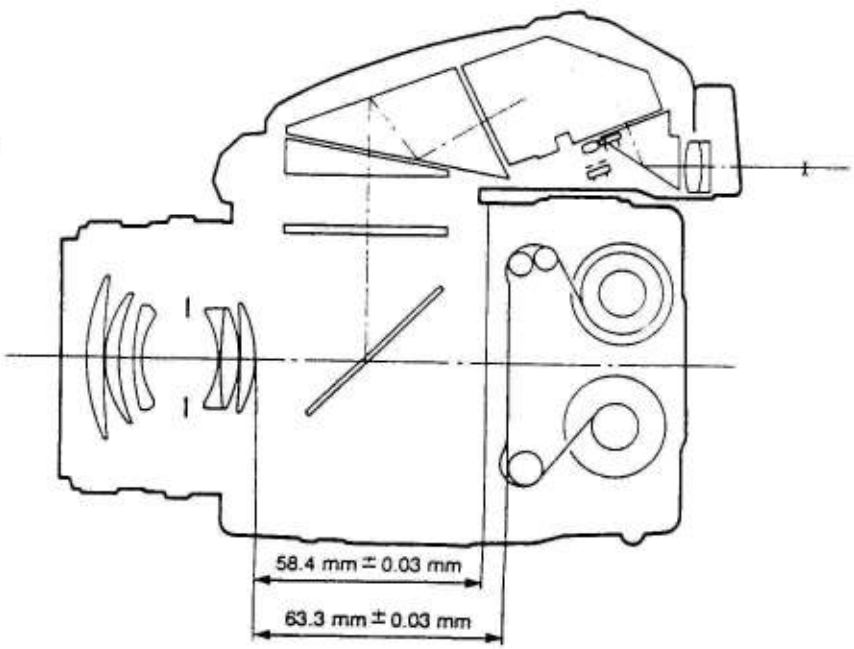
5 FLANGE-BACK DIMENSION ADJUSTMENT



Note : *From 3 kinds of jigs and tools for checking and adjusting dimensions of the flange-back and flatness of the bayonet face, remove the guide plate Ⓐ of SLS-3 (645 PRO/ M645 SUPE / M645) as shown in the drawing and use.*

(This is because the guide plate Ⓐ touches the aperture lever of the camera body and it interferes accurate measurement.)





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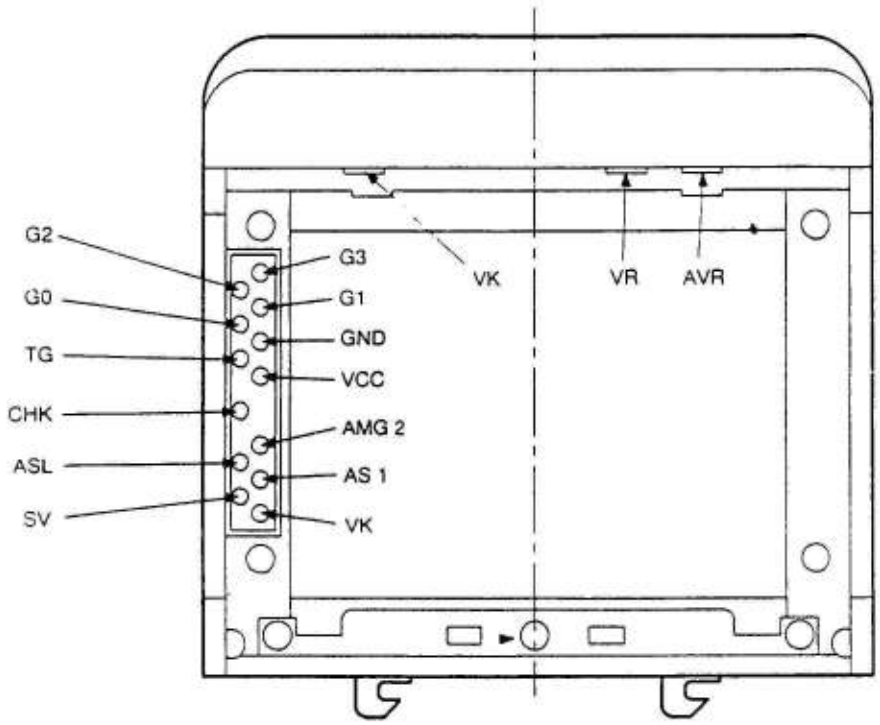
1 REFERENCE VOLTAGE •INFORMATION SIGNAL TRANSFER TERMINAL PIN

1/5 | 23



Symbol	Connection of DCV tester			Switch S
	Description Red terminal (+)	(−)	Out put	
G3	Shutter speed code	GND	1.3V or 0V	ON
G2	Shutter speed code			
G1	Shutter speed code			
G0	Shutter speed code			
GND	Ground (– Power source)	Refer to page 24 Fig. A		
TG	Trigger signal output			
VCC	+ Power source output			
AMG2	AE control signal input			
ASL	Release signal output			
ASI	Power ON signal output			
SV	ISO signal output			
VK	Reference voltage (Hi) input			
CHK	Magnet check input			
VK	Reference voltage (HI) input			
VR	Reference voltage (Lo) input			
AVR	Aperture information signal output			

Shutter speed \ Synbol	G0	G1	G2	G3
1/1,000	1	0	0	0
1/500	1	1	0	0
1/250	0	1	0	0
1/125	0	1	1	0
1/60	1	1	1	0
1/30	1	0	1	0
1/15	0	0	1	0
1/8	0	0	1	1
1/4	1	0	1	1
1/2	1	1	1	1
1	0	1	1	1
2	0	1	0	1
4	1	1	0	1
B	1	0	0	1
AEL	0	0	0	1
A	0	0	0	0

Finder contact pin signal
0=0V, 1=3V
Output resistor 1k Ω

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1 REFERENCE VOLTAGE • INFORMATION SIGNAL TRANSMITTING TERMINAL PIN

Fig. A

	Symbol	Description	Connection of the DCV tester: Red terminal (+)	Black terminal (−)	Output	S1 switch
1	GND	Earthing (− power source)		(1) Space between (−) contact points in the battery chamber (no battery)	2 Ω or lower	OFF
				(2) Pin B3 (GND)		OFF
2	TG	Trigger signal output		When the resistor of 10k Ω is connected between TG and Vcc under the condition that power source voltage is 6V, the voltage detween the TG and the GND shall be about at the time immediately after completion of wind-up motion, while it shal be 6V when the first curtain of the shutte is about to start (The needle of the swings momentarity)		
3	VCC	+power source output		(1) GND	About 6V	OFF
				(2) Between (+) contact points in the battery chamber	About 10 Ω	OFF
4	AMG2	AE control signal input		In case of the A − AEL mode, signal theAE finder is input.		
5	ASL	Release signal output		(1) GND About 6V		
				(2) When releasing the shutter, the negetive pulse of about 7.8ms width and 6V amplitube is output (But in case of the modes A and AEL, the pulse extended to about 1 sec maximum until the AMG2 becones H.)		
6	AS1	Power ON signal output		(1) GND	About 3V	ON
				(2) Shutter speed for manual operation ⬇	Voltage (3V) is hold for about 10Ω	ON
				(3) When the shutter is released.	About 0V (about 1KΩ)	ON
7	SV	ISO signal output		When the reference voltage (VK) is input, the ISO sensitivity (SV) from the film holder is output.		
8	VK	Referrence voltage (Hi) input		Reference voltage from finder is input.		
9	CHK	magnet detection input		(1) Set the shutter speed dial at the position A, and turn the to S1 to ON. when the S1 is shortet with the GND, the magnet for releasing the first curtain shall function.		
				(2) Set the shutter speed dial at the AEL, and turns the and turns the S1 to ON when the S1 is shorted with the GND the moving coil for		

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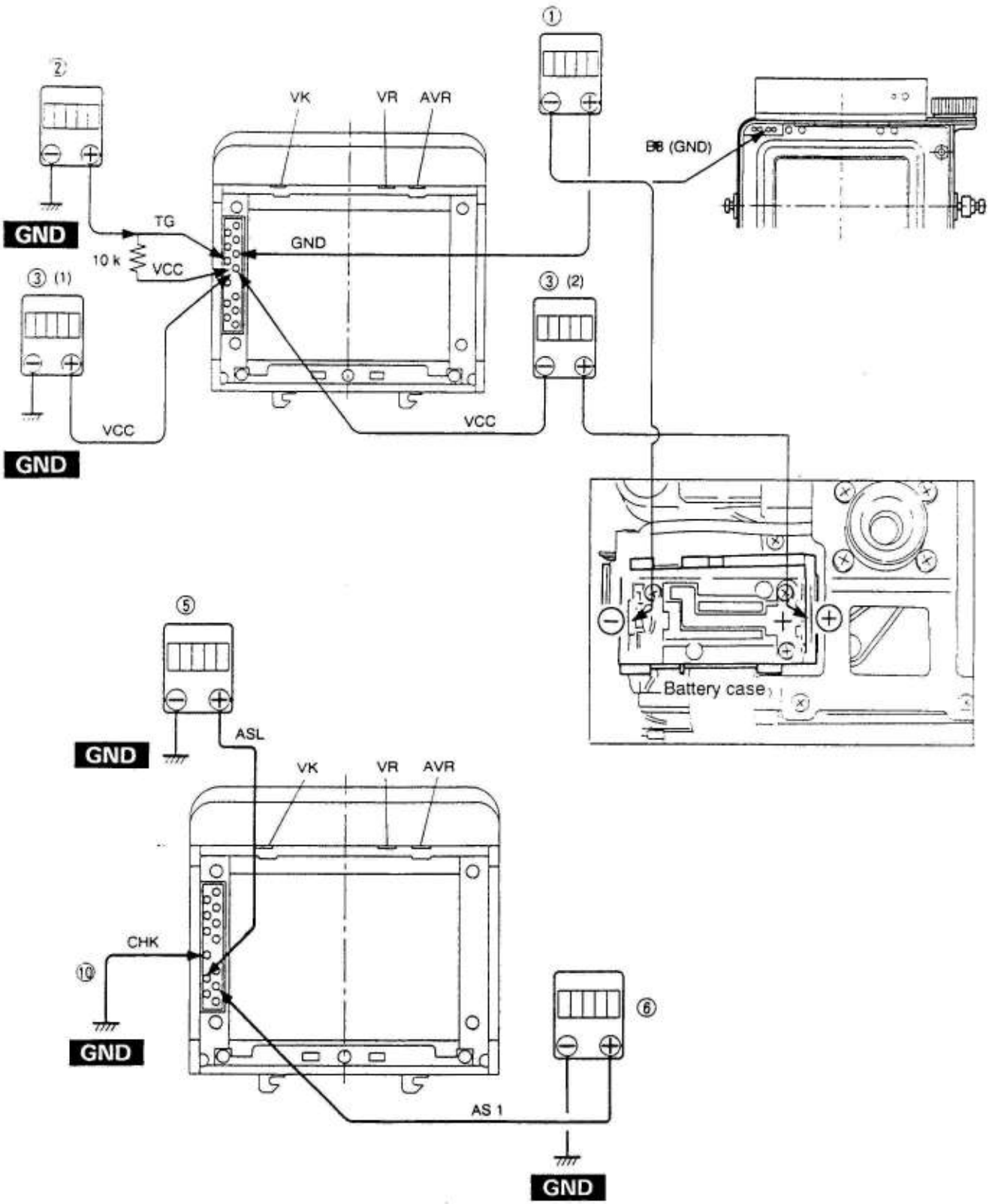

Remarks

92 AUG.

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WINDER GRIP CONTACT

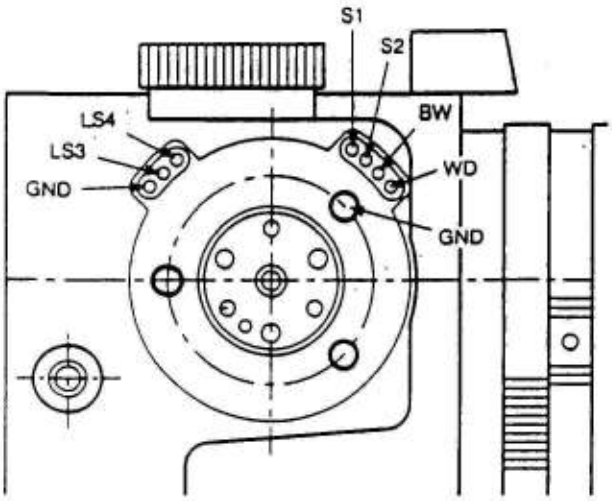

Fig.1

Symbol	Description
GND	Ground (– Power source)
S1	Half pressing signal input
S2	Release signal input
BW	Winder starting signal output
WD	Winder stopping signal output
LS4	Lens shutter mode signal input
LS3	Lens shutter preluminous signal input (When the shutter button is half pressed, it is about 3V between pin LS3 and GND.)

(See Fig. 1.)

BACK CONTACT

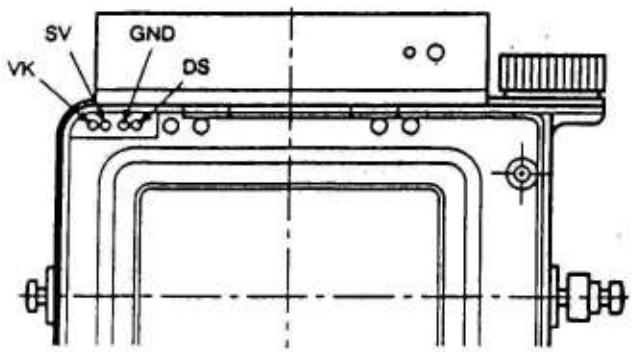

Fig.2

Symbol	Description
VK	Reference voltage (Hi) output
SV	ISO signal input
GND	Ground (– Power source)
DS	Dark Slide signal input

(See Fig. 2.)

AUXILIARY RELEASE CONTACT

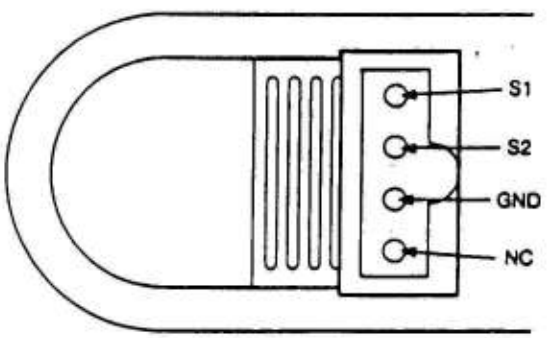

Fig.3

Symbol	Description
S2	Release signal input
S1	Half pressing signal input
GND	Ground (– Power source)
NC	Auxiliary pin

(See Fig. 3.)

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SYNCHRO TERMINAL **ACCESSORY SHOE**

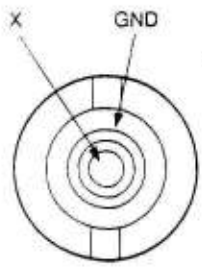


Fig.4

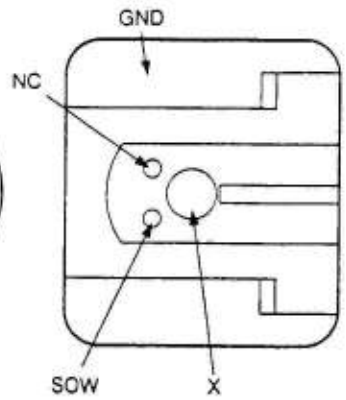
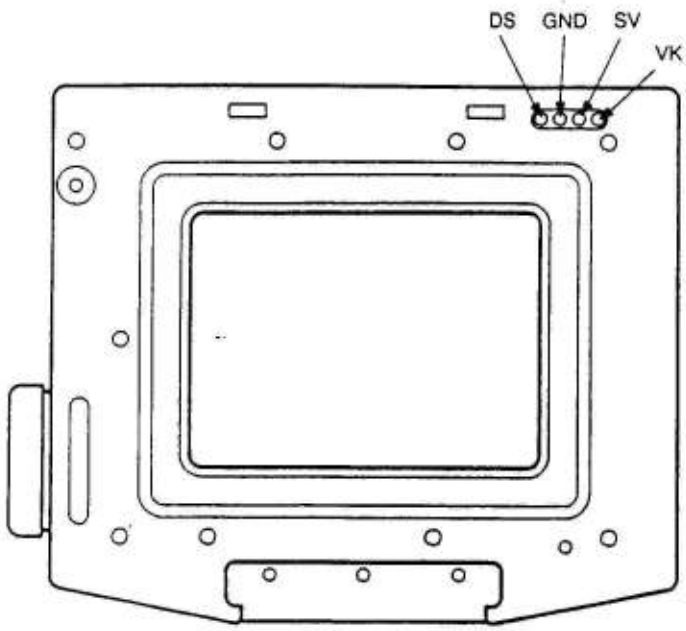


Fig.5

Symbol	Description
X	X contract
NC	Auxiliary pin
SON	Strobe recognition signal input
GND	Ground (– Power source) (See Fig. 4.)
X	X contact
GND	Ground (– Power source)

(See Fig. 5)



No.	Symbol	Description
1	VK	Reference voltage (Hi) input
2	SV	ISO signal output
3	GND	Ground
4	DS	Dark Slide signal output

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Check shall basically be made for body as a single substance.
(This check is to offer a hint to find out the cause of trouble that the shutter does not function well.)

FOUR BASIC CHECK ITEMS

1. Battery

(1) Press the battery check button and check to see if the battery check LED lights.

No →
① Is the battery polarity correct?
② Is the battery voltage 6V?
③ Check soldering of orange cord for battery check button. (See Fig. 1.)
④ Does the moving coil short? (See Fig. 2.)
(For check method, refer to page 52 of Repair Manual for the M645 SUPER.)
⑤ Check to see if the C6 (1000 μ F) condenser is properly soldered or if this part is faulty.

YES

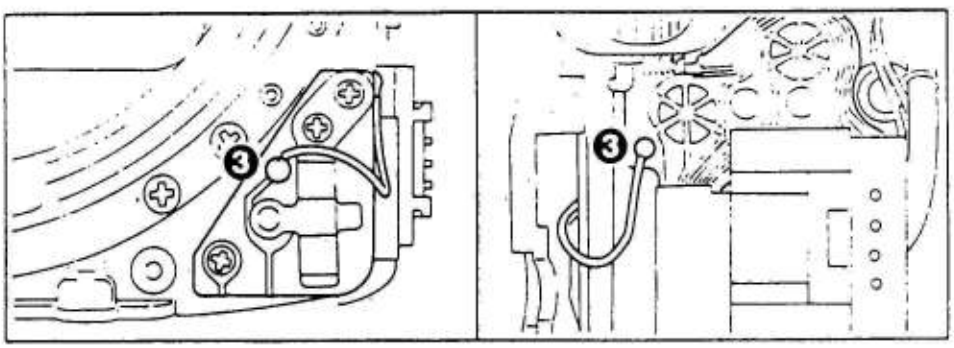

Fig.1

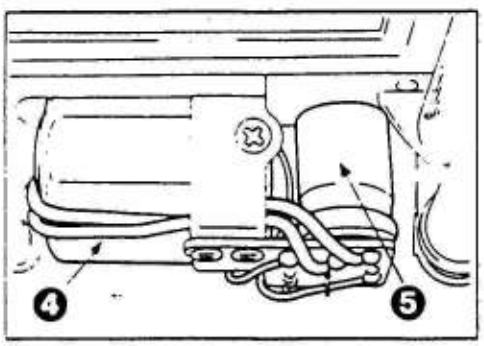

Fig.2

⑥ Check to see if battery check LED is properly soldered or if this part is faulty.

S1 = "ON" (Release button is half pressed.)
On the above condition, let the part Ⓐ of the LED short to the GND, and check the LED lights or not.

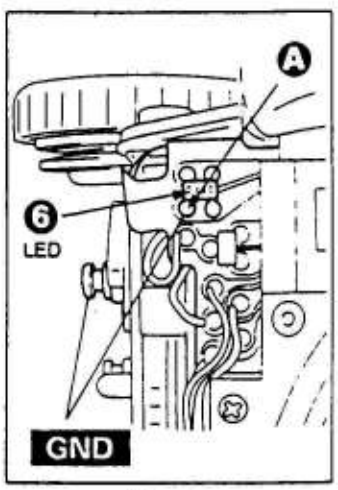

Fig.3

(The battery check circuit is made up with the relay IC, and when the battery checker does not light, it is judged that the IC is faulty. However, for the sake of confirmation, be sure to execute 4 basic item check.)

IC is faulty: Replace the main P.C.B. with new one.

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3 LEAK CURRENT CHECK AND RELEASE BUTTON HALF PRESSING CHECK

(1) When body circuit is normal, leak current is 1 μ A or less.

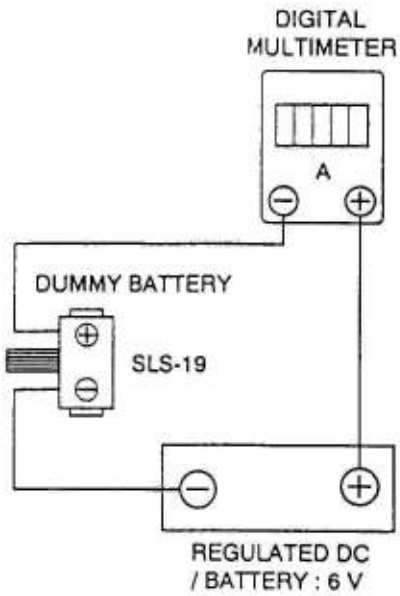

Fig.4

Notes: 1) As it is impossible to measure with an analog tester, be sure to use a digital multi-meter.

2) Be careful of the plarities of the dummy battery.
A current of about 7mA will flow if connections to the battery terminals are wrong. (See Fig. 7.)

3) As the leak current is as low as 1 μ A or less, it is rather difficult to check. Therefore, let the S1 turn ON and on this condition measure the current. After confirming that the connections are correct, measure the leak current.
(When S1 is ON, it is about 2mA.)

Current / MODEL	Leak current	Consumed current (S1=ON)
M645 SUPER	10 μ A or less	About 1.7mA to 3mA
645 PRO	1 μ A or less	About 2mA

(2) Be sure to mount new type of the reference AE Prism Finder (for M645 PRO), and if leak current is 2 μ A or more, it is necessary to change the main P.C. Board.

Note : Shutter speed dial position: A

3. RELEASE BUTTON HALF PRESSING (S1 = ON) CHECK

(1) Body is in the state that the wind-up is completed
S1 = ON → LED display in the AE finder : Lights.
S1 = OFF → LED display in the AE finder : Confirm that the LED goes out.

① S1 switch is faulty. (S1 = ON Power is supplied to the circuit.)
② Power source (Battery is faulty.)

Notes : 1) With the AE prism finder
2) Shutter speed dial position: A

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4 SHUTTER RELEASE CHECK

(1) Can the shutter be released at the shutter speed 1/1000mS • 1S • 4S • B?

No → Mount the new type AE prism finder on the camera body and check to see if the LED display inside the finder flashes at 1Hz

a) If it flashes at 1Hz:
① Dark Slide switch
② LS3 signal
③ S4 switch
There are possibilities of these switches short to the GND. (See Fig. 5.)

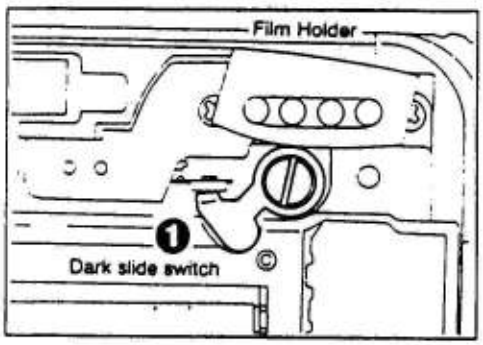
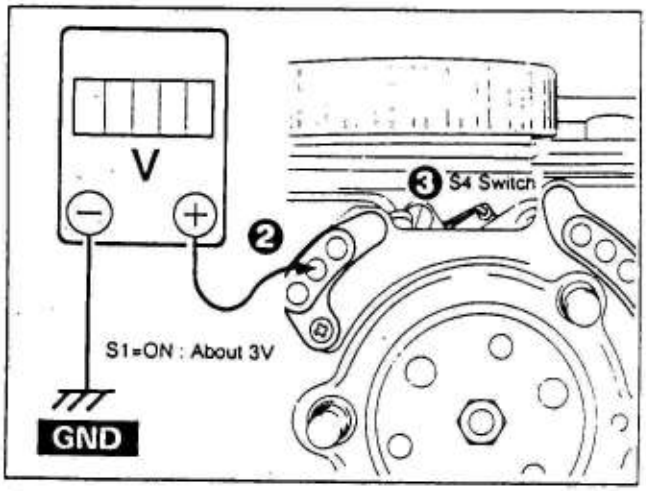


Fig.5



b) If it does not flash,
Check whether or not the sound click to tap the moving coil is heard when releasing the shutter.
① Turn shutter speed dial to 4S, and release.
If it sounds immediately after releasing, it is probable that the trigger switch is at OFF position. (See Fig. 6.)
② If it sounds 4 seconds after releasing, the release magnet does not function. Accordingly, check function of the release magnet mechanism. (See Fig. 7.)

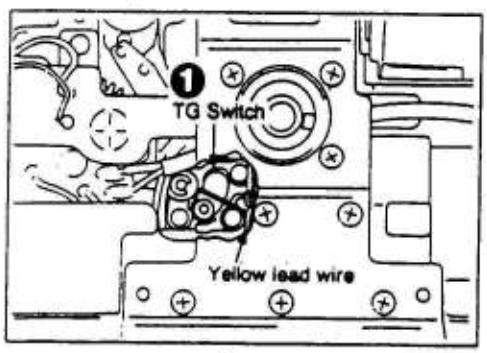


Fig.6

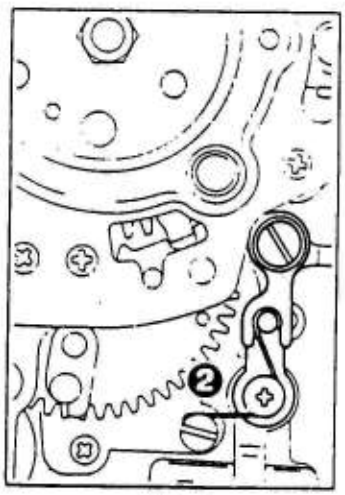


Fig.7

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FOCAL-PLANE SHUTTER EXPOSURE TIME TOLERANCE

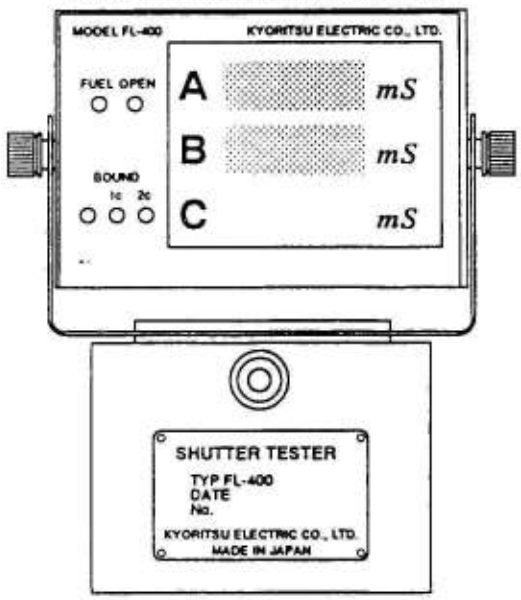
(Unit: ms)

Speed graduation	Allowance (step)	Reference value		
		+	Tolerance	−
1	± 0.5 EV	1014	1000	707
2		707	500	354
4		354	250	177
8		177	125	88.4
15		88.4	62.5	44.2
30		44.2	31.2	22.1
60		*22.1	*20.0	*18.0
125	± 0.43 EV	13.1	7.81	4.65
250		6.57	3.91	2.32
500		3.28	1.95	1.16
1000		1.64	0.976	0.58

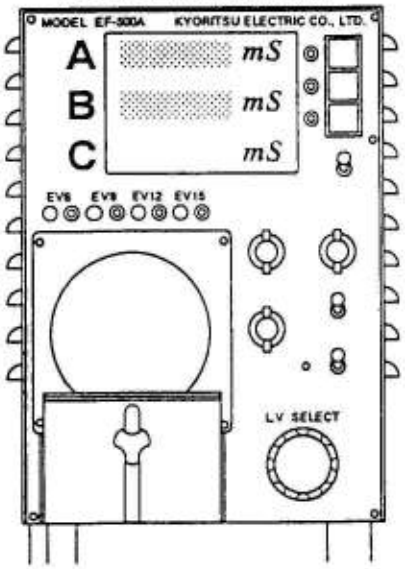
* Special standards (Countermeasure against large size strobe)
- Measured source voltage 5.8V
- Allowance Normal temperature (22° ± 5℃)

(1) X contact timing Shutter speed: 1/60 A chenel : 0.5mS~1.0mSec
B chenel : 2.5 mS or more

SHUTTER TESTER MODEL FL-400



MULTI CAMERA TESTER



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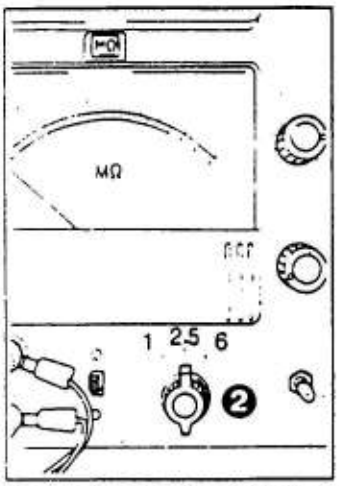
(2) Contact efficiency Synchro-terminal

Shutter speed 1/15 70% or more
Contact time ② (INTERVAL ms) 2.5 mS



Contact efficiency meter

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3. AE PRISM FINDER

3-1 OUTLINE

1. SPECIFICATION 33

3-2 DISASSEMBLY AND REASSEMBLY

1. TOP COVER DISASSEMBLY AND REASSEMBLY 34

3-3 ELECTRIC CIRCUIT

1. IMFORMATION SIGNAL TRANSFER TERMINAL PIN 35
2. DISPLAY INSIDE THE FINDER 36
3. PEFERENCE VOLTAGE 38
4. AE ADJUSTMENT (AV/SP) 42
5. BATTERY CHECK AND ADJUSTMENT 43

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1 SPECIFICATIONS

Model	TL exposure measurement at open aperture Aperture-priority automatic exposure 6 × 4.5 cm Prism finder
Prism optical system	Composed of 4 prisms including roof (Dach) prism and eye piece
Diopter	– 0.8 dptr. (Standard) Diopter correcting lens exchangeable
Metering system	Composed of 3 changeover light measuring systems, viz.: Average light measuring (Av), Partial light measuring (Sp), A-S automatic changeover light measuring
Photometry range	80/2.8N lens, by ISO 100 Ev1 (F2.8, 4 seconds) to Ev19 (F22, 1/1000 Second)
Control system	Electronic shutter control
Shutter speed	(1) AUTO : 1/1000 to 8 sec. (step interval 1/6 Ev) (2) MANUAL : 1/1000 to 4 sec. (step interval 1 Ev)
Aperture range	All 7 steps (Step interval 1/5 Ev. Coupled with all aperture values of all
Film sensitivity range	ISO 25~6400 (Step interval 1/3Ev, coupled with film holder)
Display	Character display by LED back light (1) Shutter speed: 1/1000 to 1 sec. (step interval 1Ev), LT (long time exceeding 1 sec.) B. Intermediate shutter speed is displayed by 2 shutter speed displaying lights neighboring each other. (2) Outside the limit of correct exposure: "Over" flashes, for under "LT" flashes (3) Displaying metering system: Av, Sp
Exposure correction	By means of exposure correction dial ± 3Ev (step interval 1/3 Ev)
AE lock	At the AEL position of shutter speed dial on the side of body. Shutter release button is half pressed. Measured light value is stored in memory.
Eye-piece shutter	Built-in, opened and closed by sliding knob locating on the upper part of eye-piece.
Power source	Common use of body power source. Nominally 6V.

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1 TOP COVER DISASSEMBLY AND REASSEMBLY

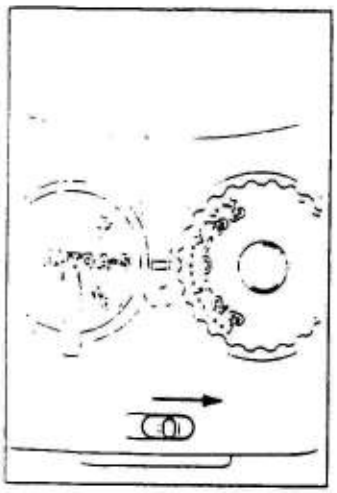


Fig.1

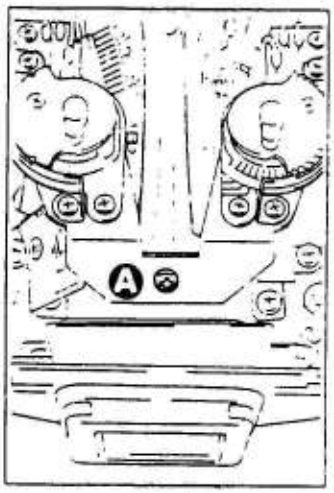


Fig.3

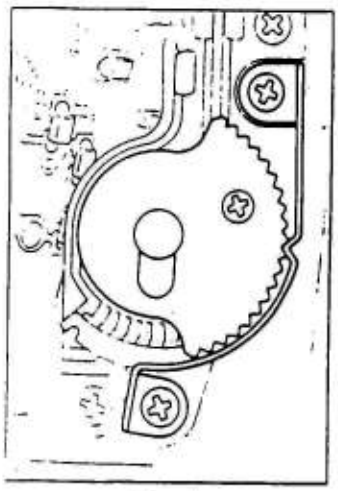
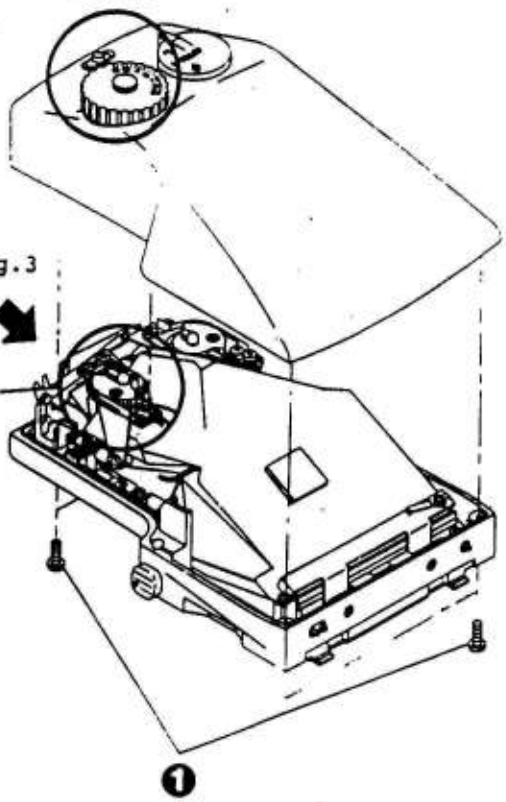


Fig.2

Fig.1

Fig.3

Fig.2



[A. DISASSEMBLY]

1. Move the eye-piece shutter knob in the arrow direction. (See Fig. 1.)
2. Set the metering system change-over dial at AUTO A-S, and set the exposure correction dial at "0". Then remove four screws ① and take out the top cover. (See Fig. 1.)

[B. REASSEMBLY]

1. Reassemble in the reverse order of disassembly.
2. The click position of the exposure correction dial is the 10th valley from left (right), which is the position "0". (See Fig. 2.)

Note : The screw Ⓐ which fasten the dial substrate sometimes pierces the prism and can break it. So, be careful for the length of the screw. (See Fig. 3.)

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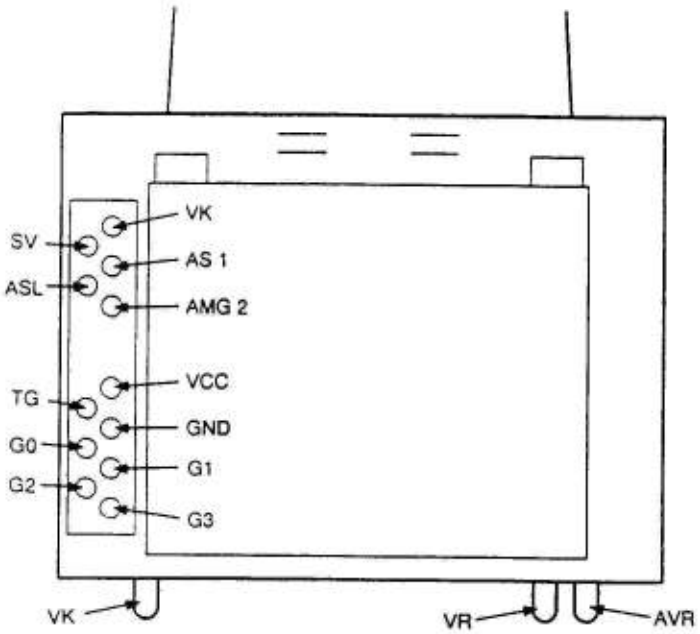
1 INFORMATION SIGNAL TRANSFER TERMINAL PIN



Symbol	Description
G3	Shutter speed code
G2	Shutter speed code
G1	Shutter speed code
G0	Shutter speed code
GND	Ground (– Power source)
TG	Trigger signal input
VCC	+ Power source input
AMG2	AE control signal output
ASL	Release signal input
ASI	Power ON signal input
SV	ISO signal input
VK	Reference voltage (Hi) output
VR	Reference voltage (Lo) output
AVR	Aperture information signal input

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AE Display

When the shutter dial on the body side is at A or AEL,

(1) When exposure is correct, one of the shutter speed graduations 1000 to 1, and Lt (in case the shutter speed is at one graduation) or two neighboring graduations (in case the shutter speed is at intermediate position of two graduations) shall light.

(2) When exposure is over, over graduation shall flash at 8 Hz.

(3) When exposure is under, graduation LT shall flash at 8 Hz.

(4) When battery capacity goes down, lighting measured exposure graduation shall start flashing at 2 Hz.

Correct exposure				Over		under		Battery capacity	
AV SP OVER	Lighting	AV SP OVER	Lighting	AV SP OVER	Lighting Lighting 8Hz	AV SP OVER	Lighting	AV SP OVER	Lighting
1000		1000		1000	Flashing	1000		1000	
500		500		500		500		500	
250		250		250		250		250	
125		125	Lighting	125		125		125	2Hz
60	Lighting	60	Lighting	60		60		60	Flashing
30		30		30		30		30	
15		15		15		15		15	
8		8		8		8		8	
4		4		4		4		4	
2		2		2		2		2	
1		1		1		1		1	
LT		LT		LT		LT	8Hz	LT	
B		B		B		B	Flashing	B	
Photometry AV Correct 60		Photometry SP Correct 125 Intermediate 60		Photometry AV-SP Lighting Over OVER LT 8hz Flashing		Photometry AV Lighting Under LT 8Hz Flashing		Photometry SP Lighting Correct 125 2Hz Flashing	

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Manual Display

When the shutter dial on the body side is at other graduations than A and AEL,

(1) Set value means that one set graduation shall light.

(2) When measured value is at one graduation, one of 1000 to 1, LT shall flash at 4 Hz.
When measured value is at the intermediate position of two neighboring graduations, two such graduations of 1000 to 1, LT shall light simultaneously at 4Hz.

(3) When set value coincides with the measured value, luminance of the graduation shall change tone at 4Hz.

(4) When battery capacity goes down, the measured exposure that is lighting shall start flashing at 2Hz.

Correct exposure				Exposure over		Exposure under		Battery capacity	
AV SP OVER 1000 500 250 125 60 30 15 8 4 2 1 LT B	Lighting	AV SP OVER 1000 500 250 125 60 30 15 8 4 2 1 LT B	Lighting Flashing Flashing	AV SP OVER 1000 500 250 125 60 30 15 8 4 2 1 LT B	Lighting Lighting 4Hz Flashing (Measured value) Lighting (Set value)	AV SP OVER 1000 500 250 125 60 30 15 8 4 2 1 LT B	Lighting Lighting (Set value) 4Hz Flashing (Measured value)	AV SP OVER 1000 500 250 125 60 30 15 8 4 2 1 LT B	Lighting 4Hz Flashing (Measured value) 2Hz Flashing (Set value)
Photometry AV Set value 60 Correct 60 Measured value 60		Photometry SP ┌ Intermediate 125 └ Correct 60 Set value 125 Luminance changes.		Photometry AV-SP lights. Set value Over Measured value 4Hz Flashing		Photometry AV lights. Set value Under Measured value 4Hz Flashing		Photometry SP lights. Set value 8 Flashes at 2Hz Measured value Flashing at 4Hz.	

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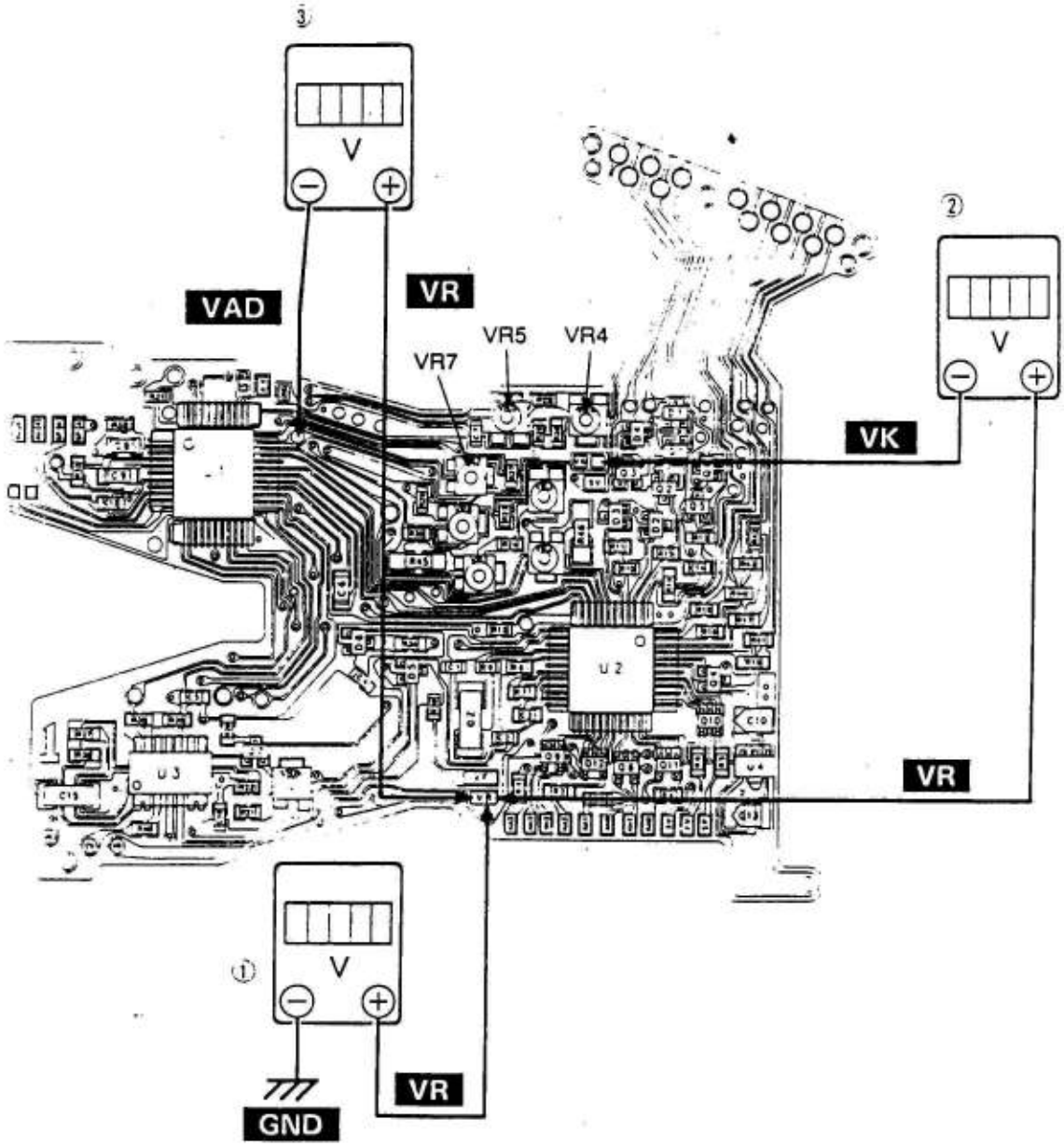
3 REFERENCE VOLTAGE



S1 : ON

		DCV Meter Connection		Output	Adjustment
		(+) Red	(−) Black		
①	VR : Operating reference voltage	VR	GND	1.0~1.2V	VR 5
②	VK : Inputting reference voltage	VR	VK	153mV ± 5	VR 7
③	VAD : AD Converting reference voltage	VR	VAD	285mV ± 5	VR 4

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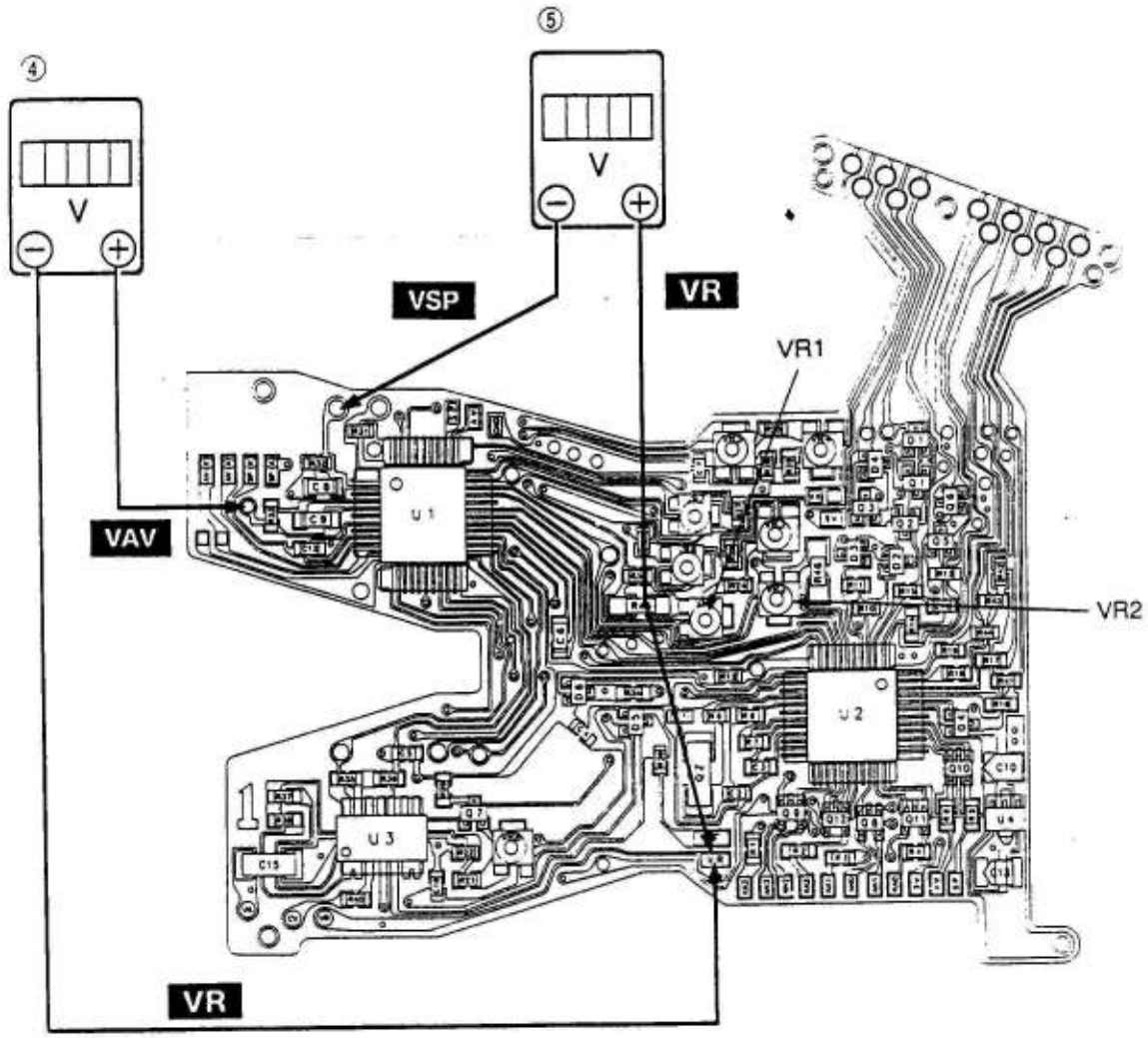

S1 : ON

		DCV Meter Connection		Adjustment
		(+) Red	(−) Black	
④	VAV : Luminance step voltage	VAV	VR	VR 2
⑤	VSP : Luminance step voltage	VSP	VR	VR 1

Note : When let the luminance change by n step, output voltage of VAV / VSP shall change by n × 18 mV.

(n =1EV
1EV=18 mV)

Remarks

92 AUG.

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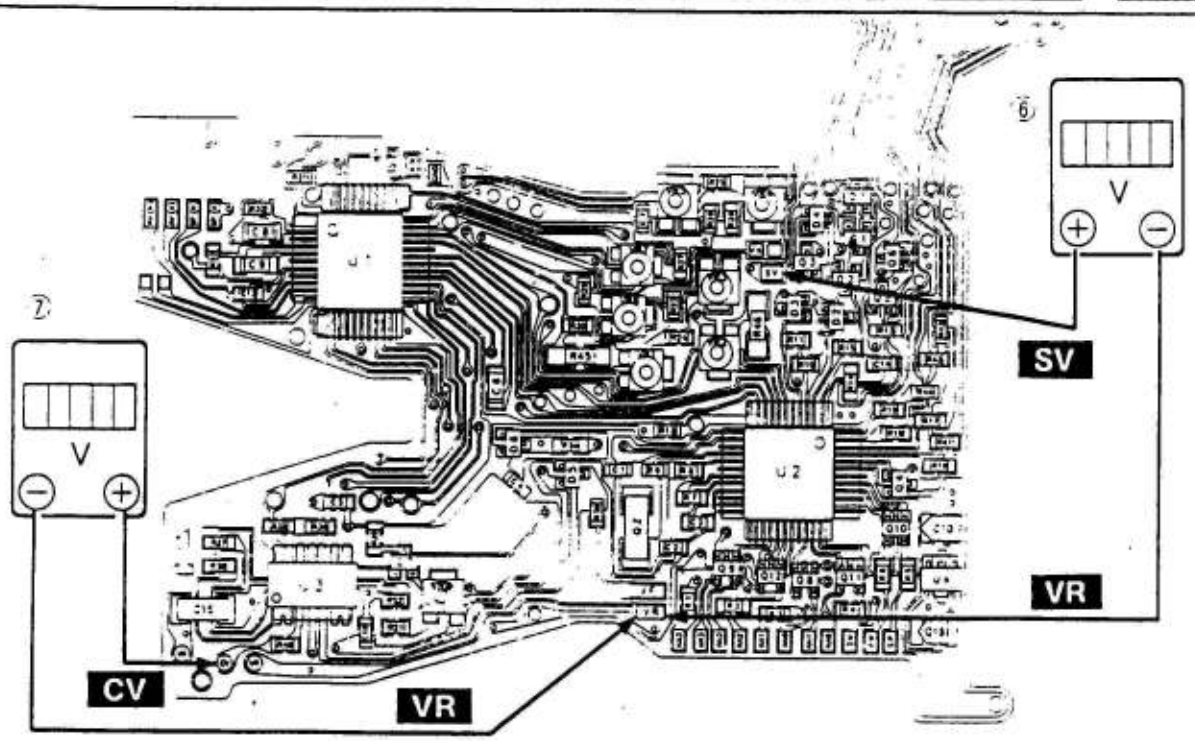
3 REFERENCE VOLTAGE



S1 : ON

		DCV Meter Connection (+) Red	DCV Meter Connection (−) Black	ISO	SV : Output
⑥	SV : ISO input voltage	SV	VR		153mV±10%
				25	144mV±10%
				50	126mV±10%
				100	108mV±10%
				200	90mV±10%
				400	72mV±10%
				800	54mV±10%
				160	36mV±10%

		DCV Meter Connection (+) Red	DCV Meter Connection (−) Black	CV	CV : Output
⑦	CV : Exposure correction output voltage	CV	VR		153mV±10%
				−2	112.5mV±10%
				−1	94.5mV±10%
				0	76.5mV±10%
				+1	58.5mV±10%
				+2	40.2mV±10%

Note : Whenever ISO dial and exposure correction dial is changed over 1 step each, output voltage shall change about 18 mV.

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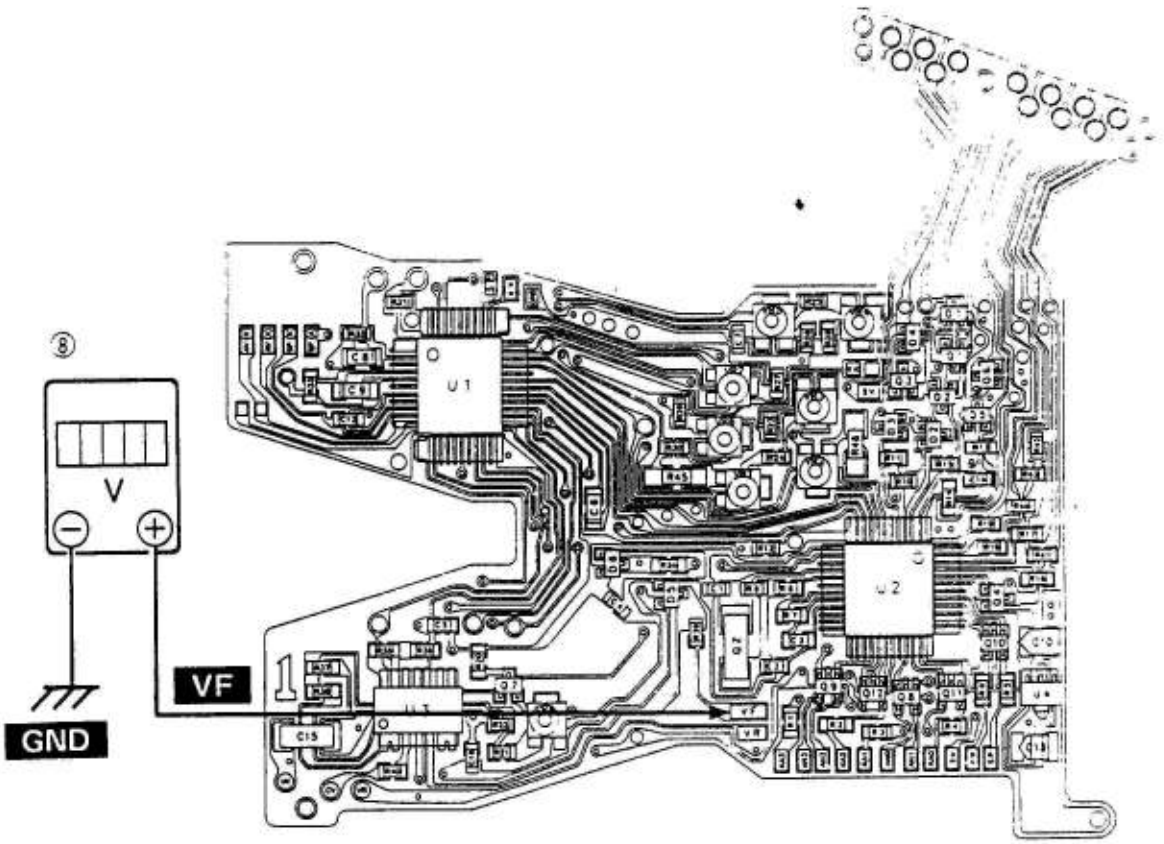

S1 : ON

		DCV Meter Connection		FV	FV : Output
		(+) Red	(−) Black		
⑧	VF : Aperture input voltage	VF	GND		1.253mV±10%
				F32	1.238mV±10%
				22	1.220mV±10%
				16	1.202mV±10%
				11	1.184mV±10%
				8	1.166mV±10%
				5.6	1.148mV±10%
				4	1.130mV±10%
				2.8	1.112mV±10%

Note : Whenever the aperture ring is changed over one step each, input voltage shall change 18mV.

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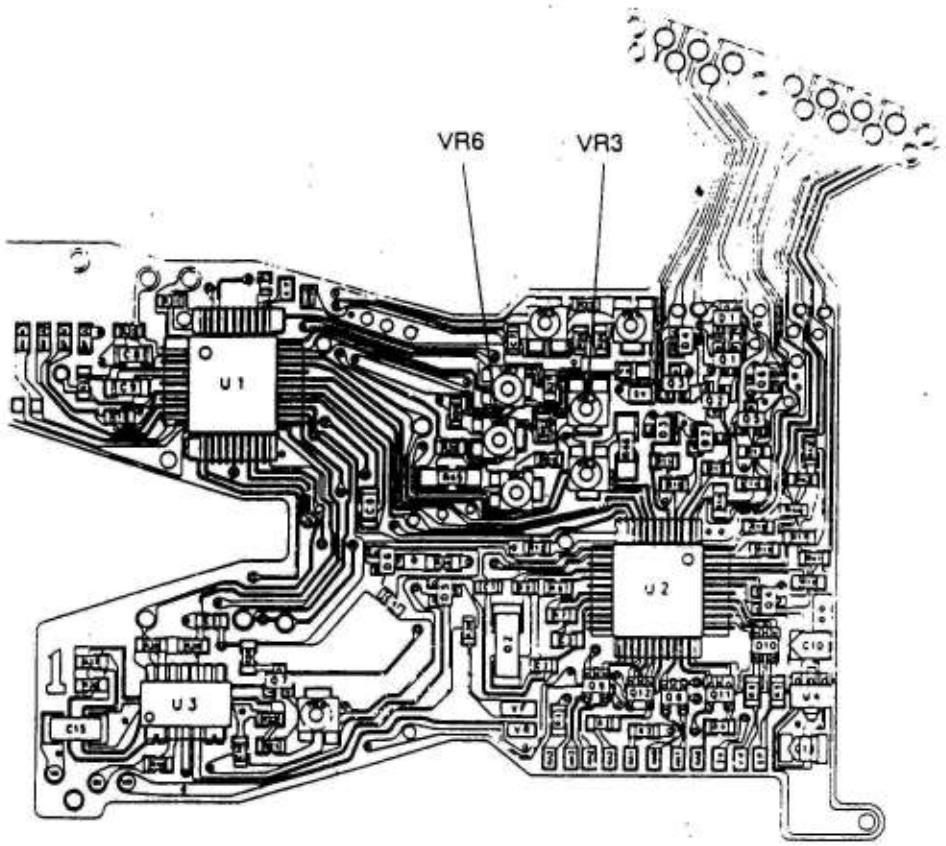
4 AE ADJUSTMENT (AV/SP)



1. AE Shutter speed adjustment

S1 : ON

TV Dial	Brightness	ISO	Aperture	CV	V/F LED	Adjuster		Reference value
						Average	Spot	
A	LV15	100	8	0	500	VR3	VR6	* – 0.3EV
	LV12				125 and 60			
	LV9				8			
	LV6				1			± 0.75E

Reference lens : F2.8/80 mm is used.

* : Reference lens shall be in common with both M645 SUPER and M645 PRO.
Adjustment shall be made on the basis that the value – 0.3EV is value "0".

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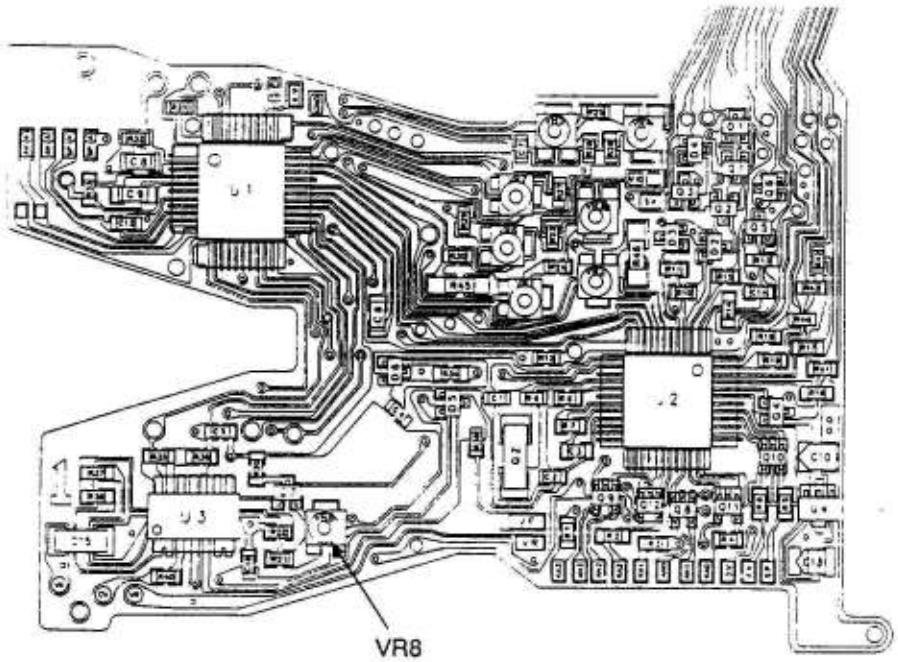

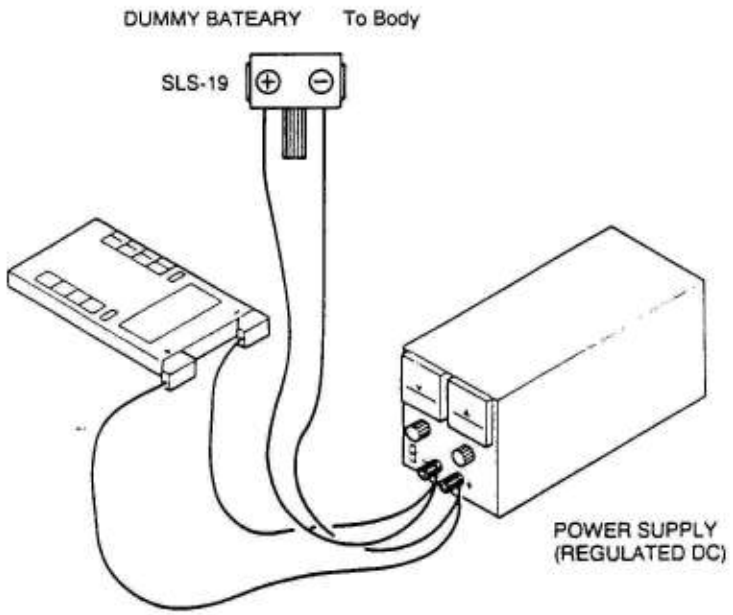

1. POWER Supply
   Set the digital tester as shown in the above illustration.

2. Press the B.C. button, turn the VR8 and so adjust that the LED (AE Finder) will flash when the voltage is within the range of 4.5 to 4.7V (indicated by the digital tester).

4.5V to 4.7V Flashing VR8

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4. WINDER GRIP

4-1 OUTLINE

1. SPECIFICATION 44

4-2 ADJUSTMENT

1. B.C. ADJUSTMENT 45

4-3 ELECTRIC CIRCUIT

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2. OPERATION SEQUENCE 48

4-4 TROUBLESHOOTING

1. MAINTENANCE FLOW 51

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Battery	6 pieces of Dry battery, Size AA (Alkaline or Ni-cad)
The number of photographing frames	1 frame photographing and continuous photographing is possible by depressing the shutter button continuously.
Wind-up time	About 0.5 sec. for 1 frame (Forcal-plane mode) About 1.1 sec. (Lens shutter mode)
The number of films possible for photographing	[Under normal temperature, and under the test conditions of our company] About 80 pcs. of AA size Alkaline battery About 70 pcs. of AA size Ni-cad battery
Operation system	Starts up by half pressing the shutter button or pressing the start button. All are ready for photographing. After completion of photographing, the film is automatically rewound and then it stops. (About 4 seconds.) [In case of M645 SUPER being used, it starts and at the starting position.] After completion of photographing, the film is rewound automatically and then it stops. (About 4 seconds)
Battery checker	Checking function with the LED display is attached.
Inputting outside commercial power	Use 9V an exclusive adaptor for MAMIYA.
When lens shutter lens is used	With an exclusive connection cord, automatic set photographing is possible.
Dimensions	(W) 77.3 × (H) 88 × (D) 72.5 mm
Weight	290mg (excluding batteries)

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1 B.C. ADJUSTMENT

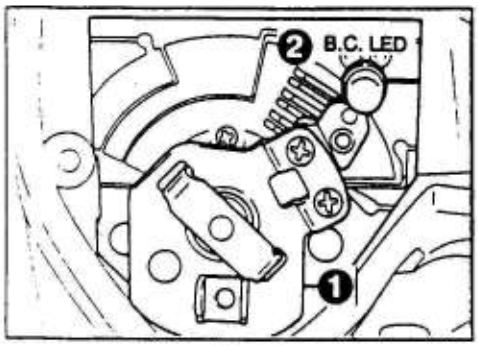
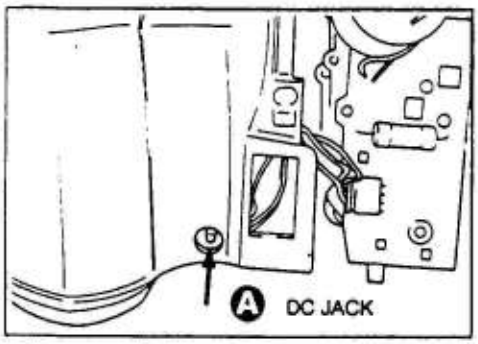


Fig.2



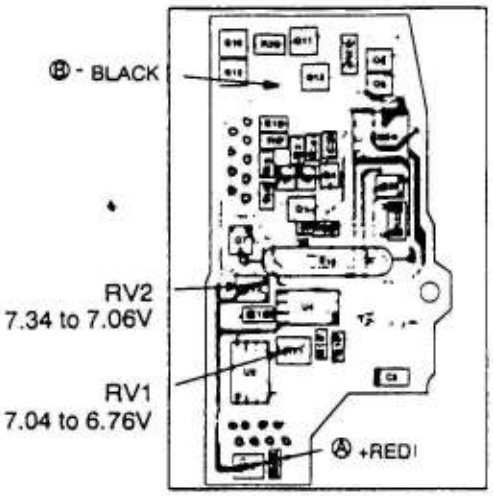


Fig.3

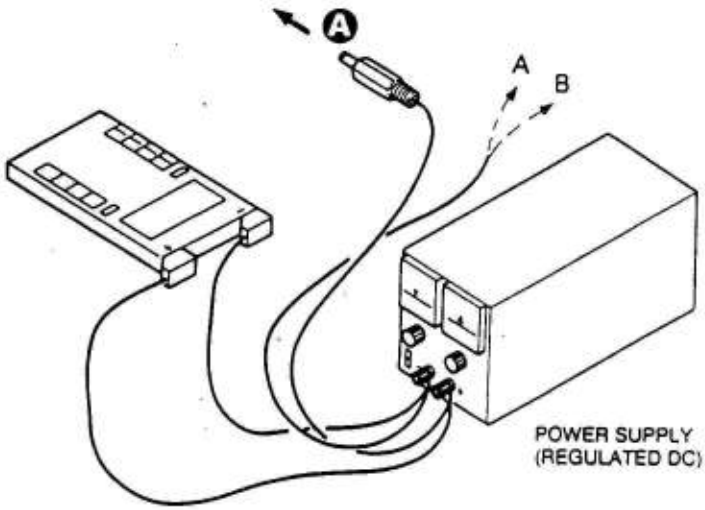


Fig.1

1. Remove the mechanism ass'y from the main body, and attach the power supply and digital tester as illustrated. (See Fig. 1.)

Note : If the DC jack is unavailable, fit the cords A + and B − to the power supply and connect to the A and B of main P.C. board. (See Fig. 3.)

2. Turn the mode selector ① to the B.C. Turn the VR2 and so adjust that the B.C. LED ② will start to light or flash between 7.34V and 706V (displayed on digital tester). (See Figs. 2 and 3.)

3. Turn VR1 and so adjust that the B.C. LED ② will flash or goes out between 7.04V and 6.76V.
   Between 7.04V and 6.76V : Flashes or goes out VR1
   Between 7.34V and 7.06V : Flashes or goes out VR2

Note : If the B.C. LED is lighted for a long time, the R18;27 Ω runs hot. Inspection and adjustment shall be carried out quickly.

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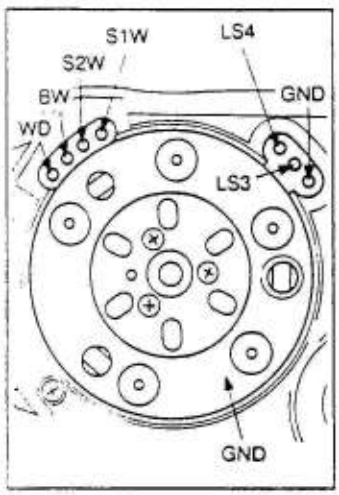
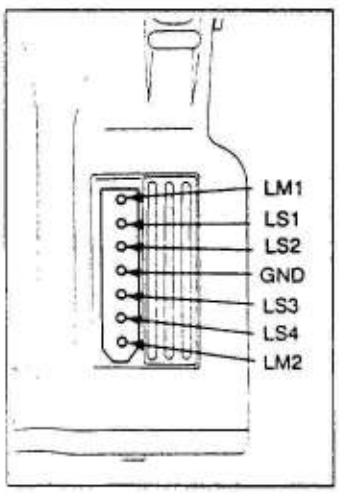


Symbol	Description
GND	Ground (–signal)
S1W	Half-press signal output
S2W	Release signal output
BW	Winder starting signal input
WD	Winder stopping signal output
LS4	Lens shutter mode signal output
LS3	Lens shutter pre-emitting signal output



Symbol	Description
LM1	Lens shutter charge motor power source output (3V outputs between Pin LM1 and GND)
LS1	Lens shutter charge control signal input
LS2	Lens shutter charge control signal input
GND	Ground (– signal)
LS3	Lens shutter pre-emitting signal input
LS4	Lens shutter mode signal input
LM2	Lens shutter charge motor power source output (About 2.6V outputs between Pin LM2 and GND)

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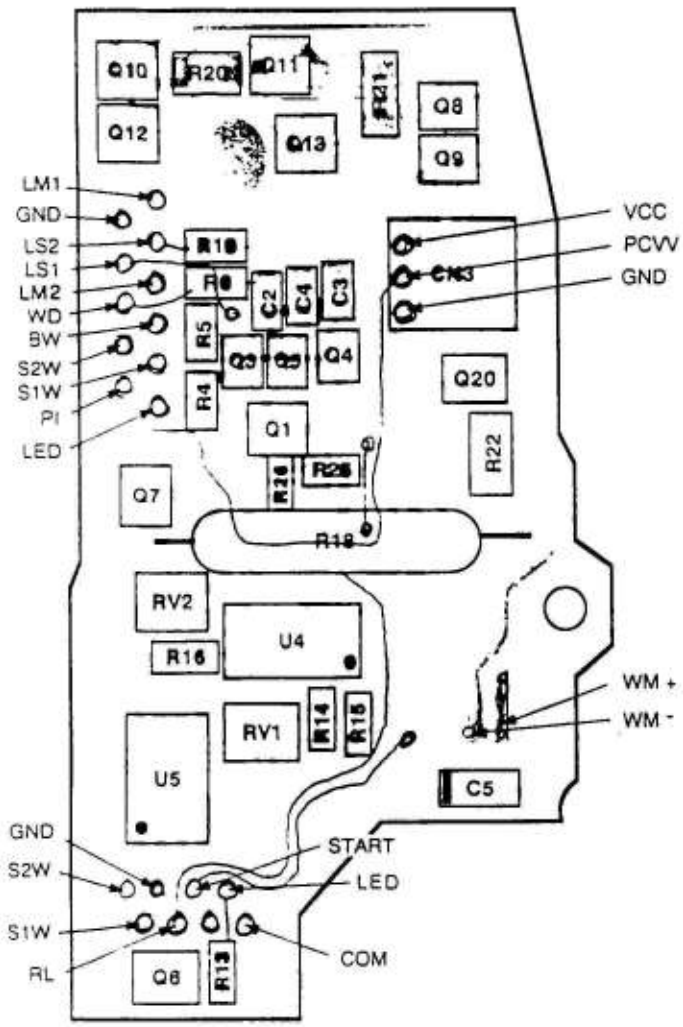

Symbol	Description
LM1	Lens shutter drive motor (+)
LM2	Lens shutter drive motor (–)
LS1	Lens shutter motor control
LS2	Lens shutter motor control
WD	Wind up completion signal Turns to H level when wind up is completed.
BW	Wind-up signal
LED	LED for encoder
PI	Control signal for encoder
COM	Ground
WM+	Motor for wind up
WM –	Motor for wind up
PVcc	Motor drive power source (9V)
Vcc	Power source for control (9V)
RL	Release lock signal After grounding it becomes enable.
BC	Power source for battery check control
START	Forcible wind-up signal under uncharged condition
SW1	Shutter first stroke switch
SW2	Shutter second stroke switch

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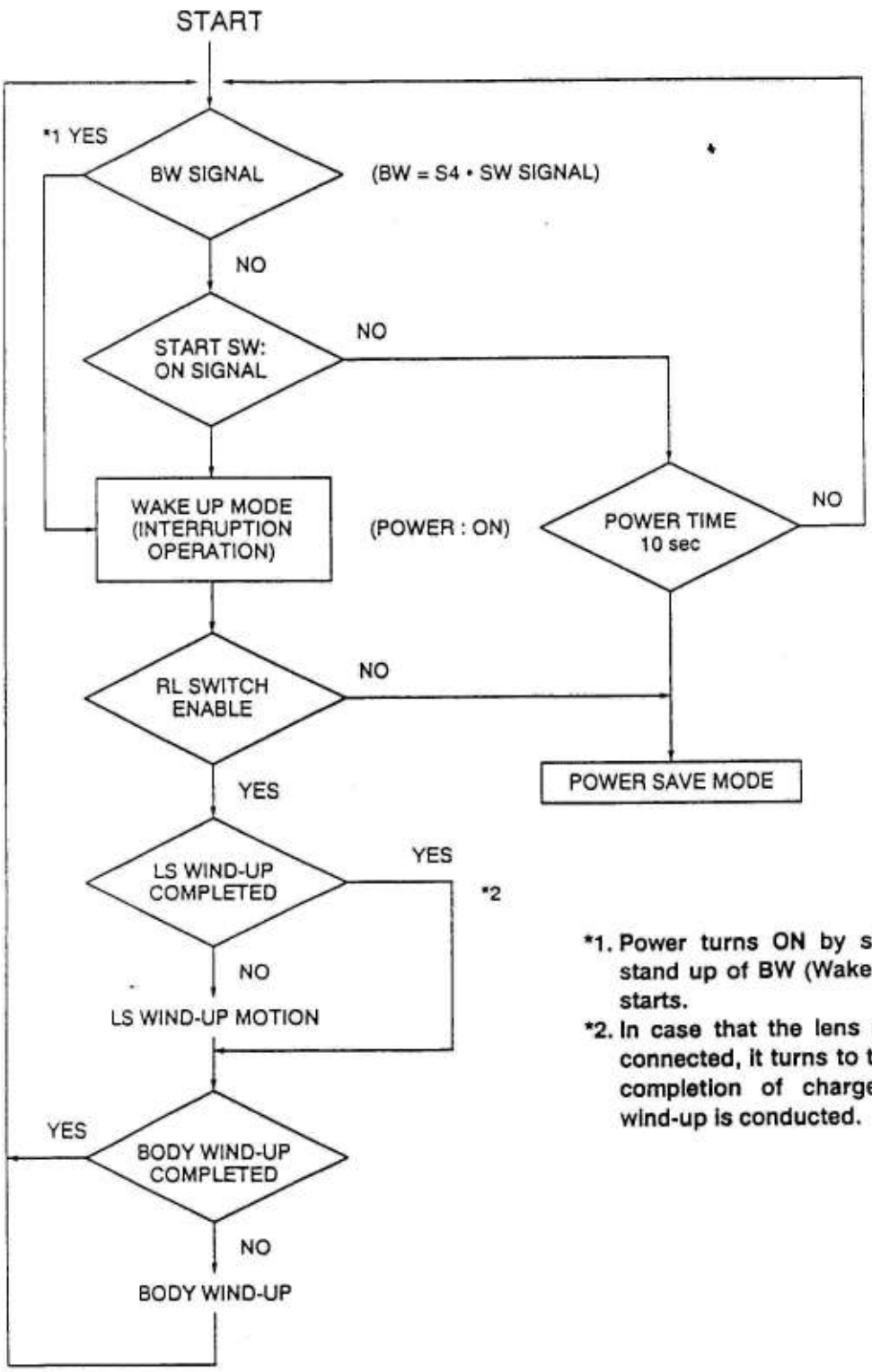

***1. Power turns ON by start switch: On or stand up of BW (Wake-up), and operation starts.**

***2. In case that the lens shutter lens is not connected, it turns to the operation of the completion of charge, and only body wind-up is conducted.**

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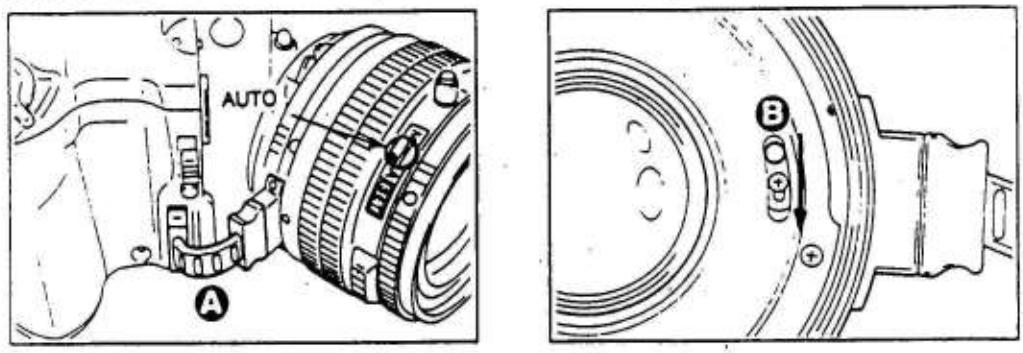
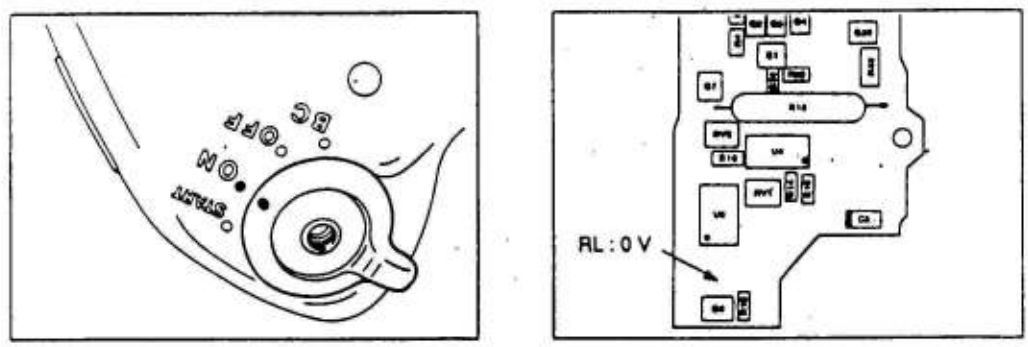
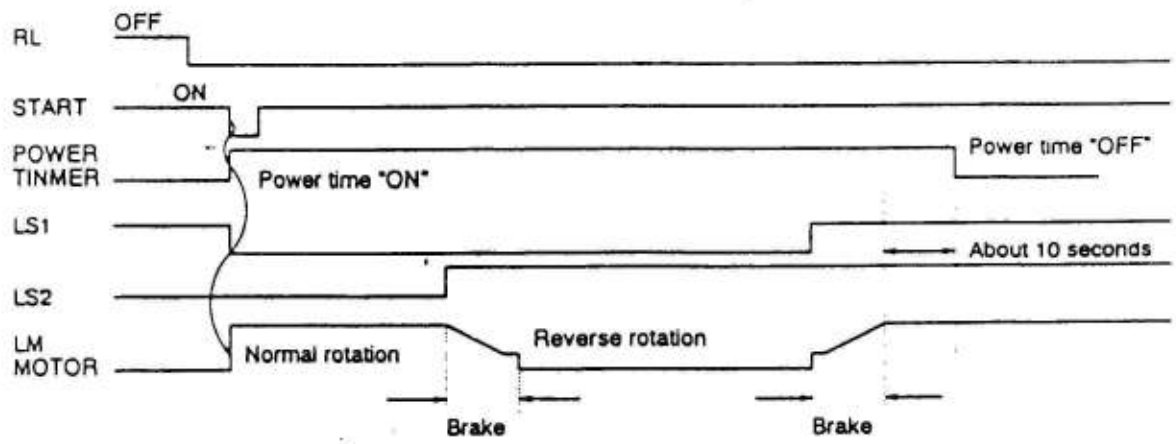
(1) Connect the lens shutter lens to the grip Ⓐ, and release the shutter Ⓑ.
(Shutter position: Set at the AUTO.)



(2) Set the winder select mode to "ON". At this time, the RL terminal becomes L (0V) level. (Action: Enable)



(3) When the winder select mode is turned to START, the lens shutter is charged.



Note : After starting normal or reverse rotation of LM motor, if the position of LS1 or LS2 does not change within 2 seconds, stop the wind-up motion.

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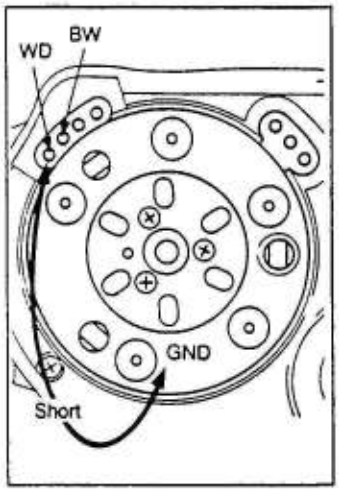
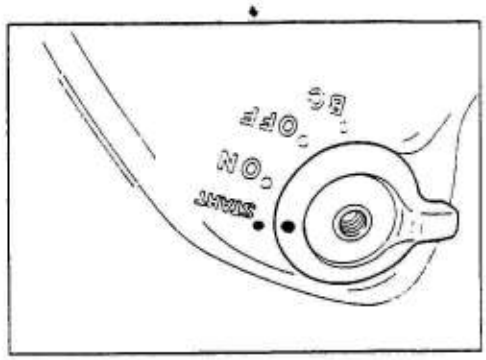
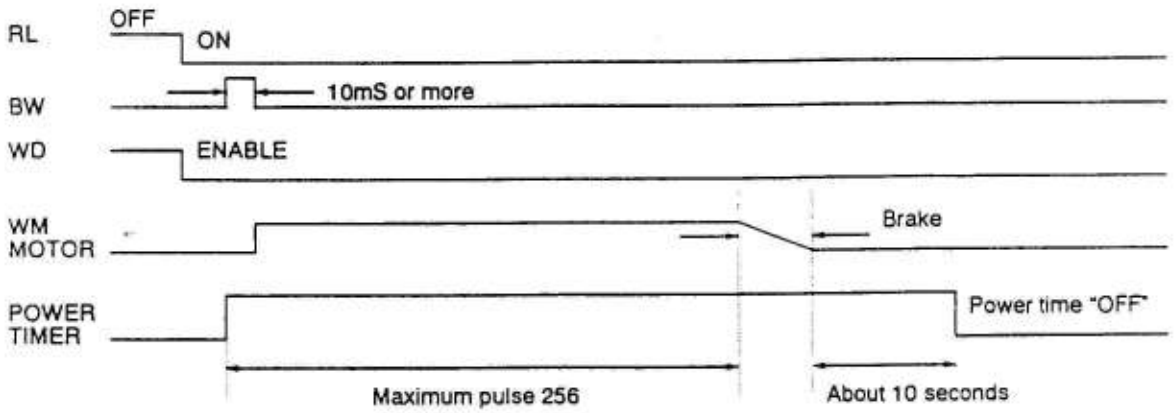
(1) Turn the select mode switch of the winder grip (in the state of single substance) ON. (At this time the RL terminal becomes L (0V) level.)

(2) Ground the WD terminal to GND, and turn the select mode switch to START for revolving the motor. (Or impress 3V or more pulse voltage to the BW terminal.)





Wind-up by the BW signal



Notes : 1) After starting the motor, if no change in pulse is recognized in the PI terminal within 200mS, stop the motor.

2) After starting the motor, if 256 pulse comes (3 to 4 seconds), stop the motor automatically. (Wind-up after 15th/30th frame)

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1 MAINTENANCE FLOW

START

Ⓐ Is 9V input in the Vcc •Pvcc? — NO → Check power source.

Ⓑ Is it turned "ON" position? RL = 0V — NO → Check select mode switch.

Ⓒ Is the WD turned to L level? 0V — NO → Check the body side.

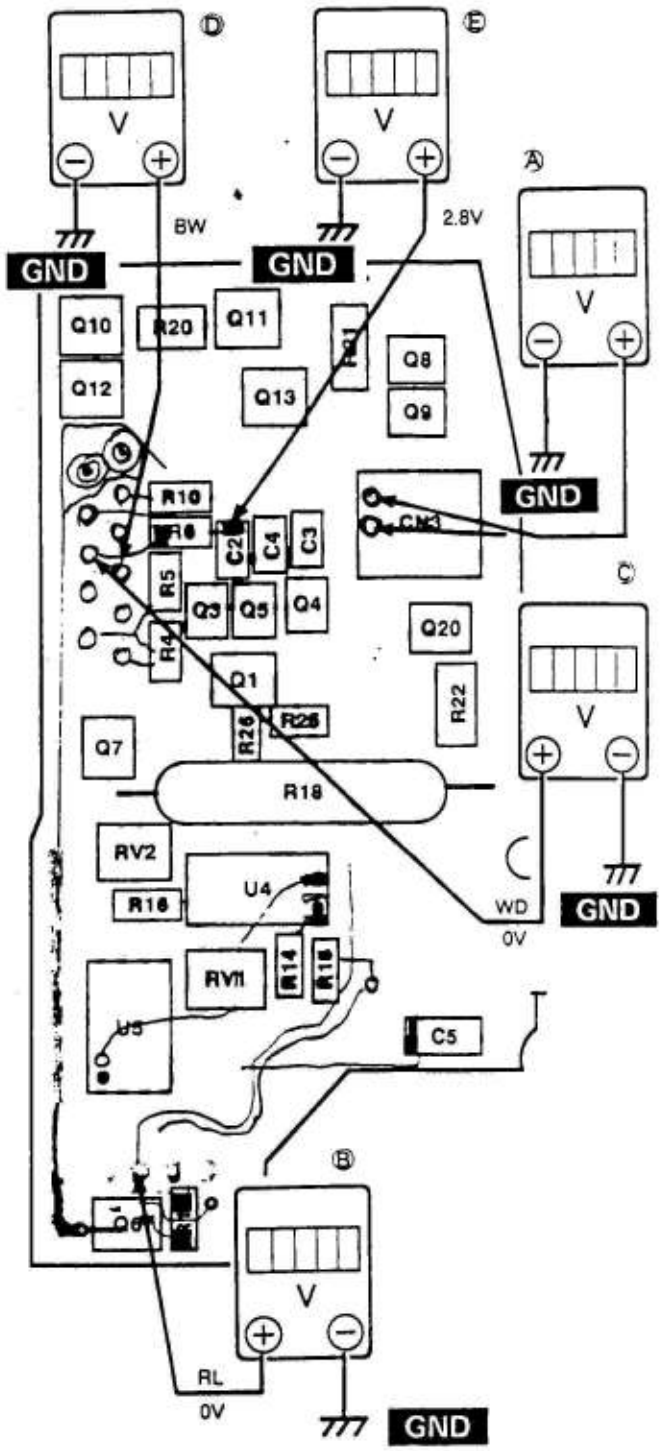
Ⓓ Is the WD signal input? 3V or more — NO → No Check the body side.

*1

Ⓔ After inputting the BW signal, is the power time signal output? 2.8V — NO → Check Q1 to Q5. (VDD 3V)

*2

Motor/P.C.B. to be replaced.



*1 : When START switch is turned ON, the needle oscillates instantaneously.
*2 : Power time voltage is automatically cut off after 10 seconds.
(When the select mode switch is turned to START, about 2.8V is output.)

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